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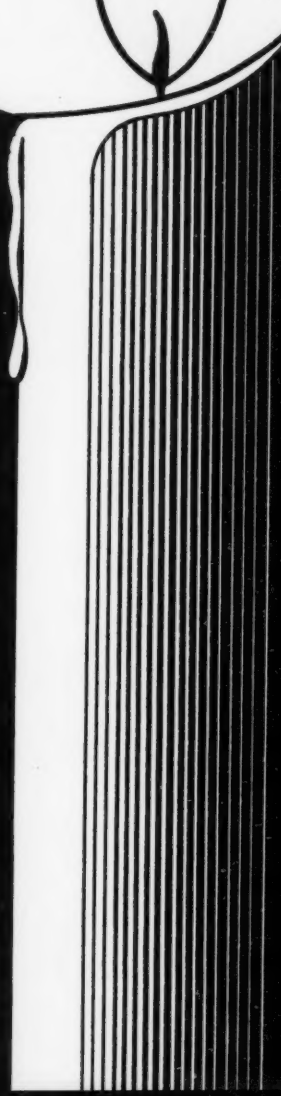

ENERGY PRODUCTIVITY

A major Air Force initiative to light the way...

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QUARTERLY

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From the Director

Our Challenge: Energy Conservation

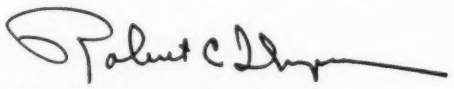
Engineering and Services has a vital role in the Air Force energy conservation effort. Our success in energy conservation, like readiness, will depend on how well we organize, educate and manage, and bring to bear our technical expertise to make our programs work.

Our facility energy management plans and programs must be well conceived, executed and, most importantly, properly communicated to Air Force facility users. Facility energy management is a tough job. First, we are, and will continue to be, in an era of tight money needed to modify buildings and utility systems. Second, many building occupants may appear to be energy conscious. But, in reality they may be unwilling to actually restrict energy use within their work areas, or more particularly, in their living quarters. Finally, there are many who simply refuse to believe that there is an energy problem and therefore will not listen to those who advocate energy conservation.

Practical use of alternative energy resources and new systems is somewhere in the future. Today's practical alternative to increased energy consumption and higher costs is to make available resources go farther—to do the proverbial more with less.

Organization, leadership, information, action and promotion are the prerequisites to conserving energy. Energy management programs, dependent on individual commitment, must not start with a flourish and die because of lack of interest. The subject is not new. "Energy Crisis and the Air Force" was the theme of this publication in August of 1973.

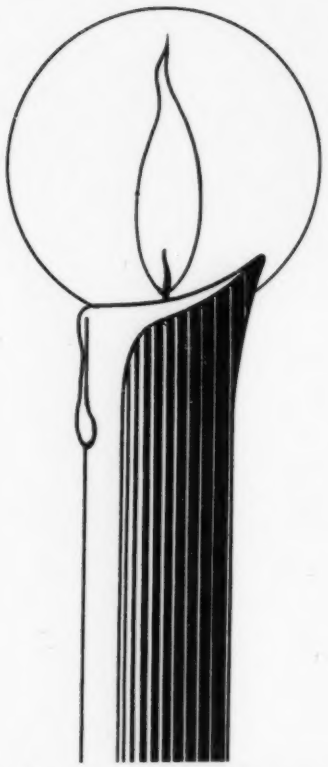
Today's energy problem, like that identified in 1973, simply will not go away. Costs will continue to spiral and resources will become more scarce. Our actions as energy managers and technical experts will ultimately bear directly on force readiness around the world. Each of us must stand up to the challenge—as citizens, and as members of the Air Force Engineering and Services Team.



ROBERT C. THOMPSON
Major General, US Air Force
Director of Engineering & Services

ENERGY PRODUCTIVITY

A major Air Force initiative to light the way...



Headquarters Air Force Logistics Command has developed a Building Energy Audit Program which is responsive to Presidental Executive Order 12003. The program seeks to quantify existing energy consumption rates and then to identify the way to reduce energy usage.

by Col William M. Shaw, PE, John B. Frounfelker, PE, and Robert H. Keggan, PE

BACKGROUND

For several years, the Air Force has promoted effective Energy Conservation Programs while considering all facets of mission operations and the Air Force installation as a community. While concerning itself with energy reducing actions, the Air Force was faced with parameters that were constantly changing. For example, in 1973, a goal was established to reduce the usage of utilities in facilities by seven percent in relation to the previous year. In 1974, the target was increased to 15 percent in relation to 1973. For a few years, the escalation of energy use because of new construction was permitted in order to determine a base line. In FY 1976, the determination was made to use the energy consumed in FY 1975 as a base line, and zero growth was set as the goal.

Initially, simple but effective procedures were implemented to reduce our energy consumption. Belt tightening consisted of turning off excess lights and raising the settings of thermostats during the air conditioning season and lowering them during the winter months. Then, the country was brought face to face with the oil embargoes. At once, what was a utilities conservation program developed into the energy conservation program.

The Energy Conservation Program as outlined in AFM 91-12 is a committee management program. That program is not capable of being responsive to the new guidelines set forth in April 1977 when President Carter's initial energy plan was submitted to Congress. Then, in July 1977, specific additional direction was issued calling for goals far greater than any previously established. The goals call for dramatic initiatives to achieve and sustain.

PRESIDENTIAL DOCUMENT

Executive Order 12003, entitled "Relating to Energy Policy and Conservation," was signed by the President on 20 July 1977. The Executive Order requires that the Administrator of the Federal Energy Administration (FEA) establish requirements and procedures by which each Federal agency would achieve—to the maximum extent possible—the following goals:

- For all Federally owned existing buildings, a 20 percent reduction in the average annual energy use per gross square foot of floor area in 1985 from the average energy use in 1975.
- For all Federally owned new buildings, a reduction of 45 percent in the average annual energy requirement per gross square foot of floor area in 1985 from the average annual use in 1975.
- To meet the above goals, 10 year plans (1975-1985) using life cycle costing techniques must be submitted to the FEA. The initial 10 year energy consumption plan to be developed by each user is to include—to the maximum extent practicable—the results of a preliminary energy audit of all existing buildings with over 30,000 gross square feet of space. These plans are to be submitted to the FEA Administrator no later than six months after FEA guidelines are issued. Approximately 12 months later, facilities with 5,000 to 30,000 square feet of floor space will be audited, with a report of findings submitted to the FEA.
- Each agency shall program its proposed energy conservation improvements of buildings so as to give the highest priority to the most cost effective projects.

HOW TO IMPLEMENT

The Directorate of Engineering and Services at Headquarters US Air Force (AF/PRE) evaluated the Executive Order and in its study came up with the following questions:

- **Can the Air Force be responsive to Executive Order 12003?**
- **Who will perform the Energy Audit for the Air Force? Will it be accomplished through Architect-Engineer services or can it be done in-house?**
- **Who is capable of performing the Energy Audit?**
- **Are there computer simulation programs available that can be responsive to the Air Force need?**

AF/PRE turned to Headquarters Air Force Logistics Command (AFLC) at Wright-Patterson AFB, Ohio, to answer these questions and commissioned the Command to initiate a pilot energy audit study. This signalled the birth of the Building Energy Audit Program (BEAP), the beginning of a major Headquarters AFLC Engineering and Services energy conservation/productivity step for the Air Force.

The pilot test of BEAP sought to quantify existing energy consumption rates and then to identify ways to reduce energy usage. Its purpose was to:

- **Be responsive to the Executive Order;**
- **Test available simulation programs;**
- **Evaluate the Air Force's in-house capability;**
- **Develop a cadre of energy experts; and**
- **Prepare recommendations regarding Air Force wide implementation.**

A building energy audit is the physical inspection of a facility in order to determine what alternatives are available to accomplish energy savings/productivity. As stated in the Executive Order, inspections of Federal facilities are essential to identify the type, size, energy use level and major energy using systems within each building.

A method of calculating the current annual energy rate for a building and the energy reduction which could be expected from various building and system modification schemes was essential to BEAP. The natural conclusion was that available computer simulation programs for heating and air conditioning analysis should be investigated. A simulation program is one in which building and system characteristics can be varied with the total annual effect on energy usage shown by the computer output.

Simulation programs which could support the Air

Force study were screened. Each program investigated was evaluated on the following factors:

- It must calculate cooling and heating loads and annual energy consumption on an hourly basis;
- It had to include the calculation of heat gains and losses from transmission, solar, outside air, people, lighting and equipment.
- It had to be able to analyze by variation of input data such factors as wall and roof insulation, building size and orientation, solar effects, fuel, system components (fans, chillers, pumps, boilers, absorbers, etc.), lighting, fresh air, people and work schedules.
- A printout of economic data was essential which would indicate life cycle cost data for a selected number of years.

Two simulation programs were identified by AF/PRE and AFLC that might be responsive to these needs. The programs had to be evaluated for engineering accuracy and logistic supportability. In other words, would the programs work and could Air Force in-house personnel be trained rapidly to utilize them?

TRACE AND BLAST

The two simulation programs used for the BEAP pilot test were Trane Company TRACE (Trane Air Conditioning Economics) and BLAST (Building Load Analysis and System Thermodynamics). BLAST had been developed by the Construction Engineering Research Laboratory (CERL), US Army Corps of Engineers, Champaign, Illinois.

TRACE and BLAST are computer programs designed as tools to assist building and system designers in the conservation of energy in both new and existing buildings. They provide mathematical simulations of comprehensive building systems and equipment plus energy and economic evaluations. Each program allows a study and comparison of the most important facets of a building that affect energy consumption. From the comparisons, the engineer can determine the most energy efficient and economical building or system retrofit alternatives to reduce consumption. Computer output includes the monthly and yearly energy consumption of the alternatives considered. In addition, consumption figures are converted into such economic factors as owning and operating costs, and return on investment or payback period.

The programs examine the yearly energy and economic impact of such building characteristics as types of glass, insulation factors, lighting, and building orientation. Various heating, ventilating and air conditioning (HVAC) systems and equipment combinations are simulated into the building design over the building/system life.

The TRACE program had been in use for several years, and its communication and computer network could support an Air Force wide energy study. Input could be on remote terminals or by tab cards. A few Air Force engineers were familiar with TRACE. BLAST had also been used on a limited basis in the Air Force. The existing CERL manpower and computer resources for training, program engineering assistance, communications, etc., to support an Air Force wide program were not known.

PILOT STUDY

The pilot test was accomplished at Wright-Patterson AFB in September and October 1977. AFLC Engineering and Services was augmented by engineers from Aerospace Defense Command, Air Force Systems Command, Air Training Command, Military Airlift Command, Strategic Air Command, and Tactical Air Command. Two teams were established, one to utilize the TRACE system and the other to test the BLAST program.

The Civil Engineering School of the Air Force Institute of Technology (AFIT), also located at Wright-Patterson AFB, assisted AFLC by arranging TRACE and BLAST training for the pilot teams. The training sessions for each team were one week in duration.

The building energy survey began with research of as-built drawings for building measurements and construction characteristics, heating and air conditioning system data, and other information applicable to the building survey. Discussions were held with individual building monitors regarding facility use, work schedules, pending projects, and known inefficient energy practices or conditions. Each heating and air conditioning system was inspected. Conditions such as inoperative controls, inefficient use of outside air, improper space temperature settings, inefficient systems, air flow and amperage measurements, and possible alterations were investigated for energy conservation. All this information was required for input to the TRACE and BLAST programs.

The teams then entered the accumulation of information on input data forms. From these forms, inputs were made to the computer by on-line remote terminal, or completed forms were furnished to data automation personnel for keypunching and input to the program.

The initial simulations were utilized to model the facility as it was presently being operated. Follow-on computer runs provided data for comparison of each alternative considered for that individual facility. A printout showing an economic analysis of the alternatives permitted simple decision making regarding the actions that should be accomplished. Some of the alternatives included: returning systems to operate as originally installed; correcting outside air management; updating controls; installing wall and roof insulation, storm windows and window shading; blocking out windows; night and weekend equipment cycling; optimizing space temperatures and connecting to an Energy Monitoring and Control System (EMCS).

Also used by the teams was information obtained from previous infrared surveys. Unusual heat transmission through roofs, walls and windows was clearly shown by infrared scanning devices. These

pinpointed the energy losses and indicated additional building modification alternatives for consideration by the TRACE or BLAST computer runs. The infrared results included those findings from a flyover scan of Wright-Patterson AFB during the winter of 1976. Other infrared systems such as cameras, television and hand-held noncontact temperature sensing devices can be used. While not a requirement for accomplishing building audits, the infrared surveys are certainly useful.

The physical inspections of facilities during the pilot study revealed the need for more than just building and HVAC system modifications. The need for intensified management action became apparent. **Many military and civilian employees were neither convinced of the existence of the energy problem; nor were they willing to enforce energy conservation policies.** As a result, thermostat settings in the facilities were not in accordance with energy conservation directives. Team members found that room temperatures during the air conditioning season were well below the 80°F standard. As fall approached and the heat was turned on, building temperatures were discovered to be well above the 68°F administrative area standard and the 55°F hangar and warehouse limit. Clearly, Air Force managers must make concerted efforts to better organize, coordinate, and direct the energy conservation program.

Other needed management actions concern the area of HVAC system maintenance. The BEAP teams found disconnected dampers and inoperative thermostats. In some cases, air handling units were blowing cold air while a second air handler was putting hot air into the same area. Obviously, the system was not designed to operate in that manner. Further, thermostats installed in some warehouses and hangars could only be turned down to 65°F. Therefore, compliance with the 55° setting was impossible. Economizer cycles in some facilities were disconnected, and hot water resets were often out of calibration. These are some of the energy related maintenance problems that can be found on a physical audit of a facility. Repairing them is usually quite simple.

AUDIT EXAMPLES

The following are three examples of the 11 buildings audited in the pilot study. Five were studied by the BLAST team and five by the TRACE group. One building was audited by both teams for comparison of the results.

Figure 1: Audit of Building No. 10 (TRACE).

BLDG 30,010 WPAFB
AB WING HQ.

ALTERNATIVES (TRACE)

CONSTRUCTED: 1944
37,752 SQ. FT.

	ESTIMATED ENERGY USE (BTU/FT²/YR)	PERCENT ENERGY REDUCTION	FIRST YEAR ENERGY COST	PROJECT COST ($)	YEARS PAYBACK
1. EXISTING BLDG	113,050	—	$18,357	—	—
2. • ARCH CHANGES * • EMCS • WATTMIZER TUBES	51,644	54.3	$10,598	$115,775	11 (X)
3. • ARCH CHANGES * • NEW VAV SYSTEM • SKIN RADIATION • ECONOMIZER • RECIP CHILLER (2) AIR COOLED	56,728	49.8	$11,862	$264,000	18
4. • ARCH CHANGES * • NEW VAV SYSTEM • SKIN RADIATION • ECONOMIZER • RECIP CHILLER (2) WATER COOLED	55,735	50.7	$11,670	$252,764	17

* INSULATE WALLS - .10
INSULATE ROOF - .05
STORM WINDOWS/SOLAR FILM

(X) RECOMMENDED

Figure 2: Audit of Building No. 485 (TRACE).

BLDG 20485
AVIONICS ENG (ASD)

ALTERNATIVES (TRACE)

CONSTRUCTED: 1970
61,794 SQ. FT.

	ESTIMATED ENERGY USE (BTU/SF/YR)	PERCENT ENERGY REDUCTION	FIRST YR ENERGY COST	PROJECT COST	YEARS PAYBACK
1. EXISTING BLDG TSTAT 72°F	374,542	—	$77,174	—	—
2. ACTIVATE ECONOMIZER, REDUCE O.A., TSTAT 68°F YEAR ROUND	314,192	19.2%	$66,143	$480	<< 1 MON
3. ACTIVATE ECONOMIZER, REDUCE O.A. (HIGH EFF DAMPERS), EMCS, TSTAT 68°F YEAR ROUND	163,353	56.4%	$40,838	$29,100	< 1 YR(X)
4. VAV SYSTEM, ACTIVATE ECONOMIZER, REDUCE O.A., EMCS, TSTAT 78°F SUM, 68°F WINTER	114,492	69.4%	$31,545	$171,625	4 YR
5. VAV SYSTEM, SAME AS ALT 4, INSULATE ROOF & WALLS, TSTAT 78°F SUMMER, 68°F WINTER	101,900	72.8%	$30,072	$295,000	5 YR

(X) RECOMMENDED

Figure 3: Audit of Building No. 4024 (BLAST).

BLDG 34024 WPAFB
AIRCRAFT CORROSION CONTROL FACILITY

ALTERNATIVES (BLAST)

CONSTRUCTED: 1963
41,794 SQ. FT.

ALTERNATIVES	ESTIMATED ENERGY USE (BTU/FT²/YR)	PERCENT ENERGY REDUCTION	ANNUAL ENERGY SAVINGS ($/YR)	PROJECT COST ($)	YEARS PAYBACK
1. EXISTING BLDG	114,900	—	—	—	—
2. REDUCE THROTTLING RANGE TO 2°F	108,300	5.7	480	24	0.05
3. REPLACE LIGHTING WITH H.I.D.		11.7	3,497	16,200	4.25
4. INSTALL NIGHT & WEEKEND RESET	75,300	34.5	2,951	900	0.3
5. NIGHT & WEEKEND RESET W/REDUCED TR	68,000	40.7	3,705	924	0.25
6. NIGHT & WEEKEND RESET WITH REDUCED TR & W/H.I.D LIGHTING	54,400	52.7	7,215	17,124	2.4 (X)
7. ADD ONE INCH INSULATION TO WALLS & ROOF	105,100	8.5	2,177	125,100	26
8. ADD THREE INCHES OF INSULATION	98,600	14.2	2,544	183,500	27

(X) RECOMMENDED

Example I (TRACE)

• Building 10, Base Headquarters. Administrative area - 37,752 Sq Ft, Two-story brick, built-up roof, single glazed windows with venetian blinds.

• **Alternatives Evaluated:** Variations of thickness in roof and wall insulation; installation of storm windows; EMCS connection to air handlers, fans, and thermostats; night temperature setback; complete blocking of windows; solar film application; Wattmizer tube installation; replacing of condensers, water cooled as well as air cooled.

• **Recommended Actions:** The architectural changes outlined in **Figure 1**; connection of the HVAC systems to EMCS; and installation of Wattmizer tubes. These will permit an annual energy savings of over 54%.

Example II (TRACE)

• Building 485, Avionics Engineering. Administrative space - 61,794 Sq Ft, Brickfaced concrete block, built-up roof.

• **Alternatives Evaluated:** Reactivate inoperative economizer; repair and setting building thermostats to prescribed temperatures; reducing outside air; EMCS connections; variable air volume (VAV) system; and architectural changes.

• **Simulation Results: See Figure 2.**

• **Recommended Actions:** The combination listed as alternative Number 3 on **Figure 2** which will result in annual energy savings of 56.4%. Note the payback period is less than one year.

Example III (BLAST)

• Building 4024, Aircraft Corrosion Control Facility

Aircraft maintenance facility - 41,794 Sq Ft, Steel frame with corrugated steel wall panels and roof, one inch insulation.

• **Alternatives Evaluated:**
• **Simulation Results:** } See **Figure 3.**

• **Recommended Actions:** Alternative combination Number 6 provided a 52.7% energy savings with only a 2.4 year payback.

OVERALL TABULATED RESULTS

• A tabulation of the recommended actions for the eleven audited buildings is shown in **Figure 4.** The total cost of these projects is $1,444,000. They should provide an energy reduction for these buildings of 49%. These represent an average reduction of 35 million BTU per $1,000 cost.

PILOT STUDY CONCLUSIONS

The pilot study conducted by AFLC showed that the Air Force can be responsive to the Executive Order. Both the TRACE and BLAST simulation programs provide the engineering tools for simulation and alternative comparisons for decision making. Air Force engineers and technicians can be trained and are capable of accomplishing the required building energy audits.

The Air Force wide initial building audit workload involves 2,360 facilities over 30,000 square feet with about 25 percent being duplicates or very similar.

BLDG. NO.	PROJECT DESCRIPTION	% ENERGY REDUCTION	PROJECT COST ($1000)	YEARS PAYBACK
3010 (ADMIN)	WALL/ROOF INSULATION, STORM WINDOWS/SOLAR FILM, EMCS, WATTMIZER TUBES	54	116.0	1.1
20016 (ADMIN)	EMCS CONTROL	37	27.0	.3
20050 (ADMIN)	SPACE TEMPERATURE RESET	48	16.5	4.7
30071/714/ 174 (WHSE)	CEILING/WALL INSULATION, BLOCKED WINDOWS, H.I.D. LIGHTING, SPACE TEMP RESET	50	207.2	14.0
20127 (CAFE)	ROOF/CEILING INSULATION, EMCS CONTROL, BLOCK WINDOWS, NEW KITCHEN EXHAUST SYSTEM	54	123.0	14.0
30206 (HANGAR)	REMOVE WINDOWS, INSULATE ROOF/WALLS, EMCS CONTROL	65	832.0	20.5
30258 (WHSE)	RELOCATE OFFICE, NEW LIGHTING, TIMERS, NEW OFFICE AC/HTG SYSTEM, ELIMINATE WHSE HEAT	75	73.7	11.0
20641 (AFIT)	REDUCE LIGHTING	9	–	–
20676 (COMP CENTER)	ENTHALPY ECONOMIZER CYCLE	22	8.0	1
20685 (AVIONICS ENGRG)	HIGH EFFIC DAMPERS, EMCS CONTROL	56	29.1	1
34024 (CORROSION CONTROL)	NIGHT/WEEKEND SET BACK, H.I.D. LIGHTING	53	17.1	2.4

Figure 4: Summary of Buildings Audited.

The follow-on requirement will cover approximately 18,000 facilities of between 5,000 and 30,000 square feet, of which 40 percent are similar. The time to survey a building, develop alternatives, and input data to the computer for a 30,000 plus square foot building is five working days. This is based on an optimum team of one mechanical engineer and an engineering technician. An architect and an electrical engineer must be used on a consulting basis. A summary of the Air Force wide workloads and mechanical engineering resources are depicted by MAJCOM or separate operating agency, **Figure 5.** From this data, it is obvious that in-house forces are adequate to perform the workload.

Estimates of obtaining the required energy audits by Architect-Engineer services and by in-house forces showed a three to one cost ratio in favor of in-house accomplishment. In addition, our engineers are more familiar with Air Force facilities.

While both the TRACE and BLAST programs could perform the required simulations, BLAST could present a logistical problem in an Air Force wide application. At present there is not sufficient CERL instructor personnel or adequate functional user data for an Air Force wide training program. Further, direct expansion air conditioning systems cannot be simulated by BLAST. Complete computer support is not predicted to be available before the summer of 1978. Based on these conclusions, AFLC recommended to AF/PRE that the audits be performed in-house using the TRANE Company's TRACE program.

THE AFLC APPROACH

There are numerous approaches to implementing the BEAP in each command. AFLC will accomplish its audits in the following manner. The command has 51 civil engineering and services mechanical engineers and 406 facilities of over 30,000 square feet to be audited. Approximately one-half of the engineers have been trained on TRACE by the Trane Company in one week at Headquarters AFLC. The remaining mechanical engineers will be

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available at the bases for continuance of the O&M, MCP and day-to-day engineering workload. The 25 engineers, each with an engineering technician, will complete their building audits, determine the energy reducing alternatives, and prepare audit information booklets. These booklets will be forwarded to AFLC for central input to the computer system for simulations. The whole process, including selection of the optimum plan of actions, should be completed in 18 weeks. Cost effective projects will be prioritized in the O&M and MCP

(Continued on page 21)

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Figure 5: Workloads and Mechanical Engineering Resources.

COMMAND	MECHANICAL ENGINEER	30,000+ SF BLDG	BLDGS PER ENGR 30,000+ SF	5,000 – 30,000 SF BLDG	BLDGS PER ENGR 5–30,000 SF
(AAC) ALASKAN AIR COMMAND	10	71	7+	887	88+
(ACD) USAF ACADEMY	4	16	4	39	10
(ADC) AERO DEP. COMMAND	20	67	3+	1257	63
(AFE) USAFE	30				
(AFR) HQ AF RESERVE	21	67	3+	428	20+
(ANG)		133		902	
(ATC) AIR TRAINING COMMAND	43	235	5+	1926	31+
(AU) AIR UNIVERSITY	4	27	7–	309	77+
(CSV) AF COMM. SERVICE	10	10	1	60	6
(DAA) AF DATA AUTO. AGENCY	2				
(ESA) E & S AGENCY	13				
(HAF) HQ USAF	6				
(LOG) AF LOGISTICS COMMAND	51	406	8	1223	24
(MAC) MIL AIR COMMAND	53	234	4+	2125	92
(PAF) PACIFIC AIR FORCE	39	66	2+	580	15
(SAC) STRATEGIC AIR COMMAND	72	443	6	4480	62
(SYS) AF SYSTEMS COMMAND	40	363	9	1313	33
(TAC) TACTICAL AIR COMMAND	50	217	4+	2293	46
(USS) SECURITY SERVICE	12	3	1–	52	4+
		2,360		17,878	

"It is also important to understand that if a new electric generating technology, such as nuclear fusion or some solar electric technology were to become available and commercially competitive by the year 2000, it would require 40 years just to replace the system existing in the year 2000, even if a new one billion dollar plant were completed each week for those 40 years."

Representative M. McCormack
House Committee on Science
and Technology

"Coal is almost certainly going to become our premier fuel by the end of the century. If we had shown an ounce of foresight in years past, it could already be our premier fuel; can you imagine where this country would be if we had devoted one-tenth of the money and enthusiasm to coal that we have lavished on nuclear energy?"

Senator Dale Bumpers
US Senate Committee
on Armed Services

Contemporary Issues

AIR FORCE FACILITY ENERGY PROGRAM

by Col James R. Hawkins, PE

The Air Force Facility Energy Program is too broad a subject to discuss adequately in one article; however, there are a number of points that are of contemporary interest. As a background for these points, the President's Executive Order 12003 which was released in July 1977 gives the overall direction to the facility energy program. The stated goals are to reduce the consumption in our current facilities by 20 percent by 1985 and, when constructing new facilities, they are to be 45 percent less energy intensive. Both goals use a 1975 base line. The new Department of Energy is expected to publish the final implementing guidance in May 1978. The delay in final guidelines is a result of laws requiring both a financial impact analysis and an environmental assessment. In all probability, the final guidelines will be quite similar to the current draft which forces rather sophisticated analysis of existing building energy use to determine cost effective retrofit investments.

As further background, we should all be aware of the strong support that the Congressional Committees have given to the energy programs of the Military Services. The Senate Armed Services Committee added $100 million to the FY 1978 Military Construction Program (MCP) Energy Investment Program and criticized the internal program cuts on the way to Congress. The Senate Report also included the following suggested goals for the elimination of gas and oil fired energy plants:

"First, the Defense Department should eliminate its reliance on natural gas as a fuel for large energy plants (except in rare special situations) by 1980."

"Second, the Defense Department should eliminate its requirements for oil as a fuel for large energy plants (except in rare special situations) by 1985." With such detailed Congressional Committee interest and Presidentially directed goals, there undoubtedly will be continued investments and related action in the Air Force Facility Energy Program.

There are a number of contemporary issues of interest to Air Force engineers who are associated with facility energy conservation. The resolution of these issues and their spinoff workload will affect each base. The following description of these issues explains how they are viewed in Washington.

1. **"In the near future, we're going to have to eliminate our dependence on natural gas and oil fuel heating. The most likely alternative is coal fired central heating plants with effective stack gas scrubbers."**

Energy economists agree that the end of natural gas supplies is in sight. Furthermore, the world demand for oil is expected to exceed production in the 1980s with accompanying shortages to follow. To satisfy our need for central heat, the nuclear alternative is not practical. Environmental concerns, down time for fuel rod changes, and massive developmental costs in the 50

mega watt range restrict this as an alternative source. With the exception of family housing, central or individual solar systems are unlikely to serve more than a small percentage of the load due to initial expense and requirement for large storage media when a full backup heating system is eliminated. As an interim measure, our plan is to provide oil storage and burner assemblies for 5 MBTU and larger natural gas fired boilers until we can afford the investment for modern coal fired central plants. This interim measure becomes suspect if the initial cost grows much above $500,000 at a base. Economic studies frequently point toward early investment in the more expensive coal fired plant, thus skipping the interim measure. One central coal fired plant is included in the FY 1979 MCP, that being F. E. Warren AFB, Wyoming. Large plants for Malmstrom AFB, Montana, Fairchild AFB, Washington, and Ellsworth AFB, North Dakota, are under design. In addition, conceptual and feasibility studies are under way with MCP funds for nine other major bases.

2. **"Tests by the Michigan Consolidated Gas Company show that oversized flues and standard flue draft diverters waste a large percentage of the fuel consumed in average residential homes equipped with natural gas fired furnaces."**

Those tests demonstrate that automatic flue gas dampers can save approximately 23 percent of the fuel use. In two years of testing in more than 400 metropolitan Detroit homes, Michigan Consolidated found repeated evidence of oversized flues which pull heat out of furnaces. It was also found that replacing pilot lights with an electric ignition system can save an additional three percent of the heating fuel. To take advantage of these savings, the Family Housing Division has obtained funds for 16,700 damper installations and 27,000 electric ignition systems. These initial

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projects will be completed in time for the next heating season and are expected to save 324 billion BTUs annually or an equivalent of 54,000 barrels of fuel oil.

3. **"Our heavy investment (Figure 1) in basewide energy monitoring and control systems (EMCS) has great energy savings potential but its Achilles' Heel is the lack of specialists under MAJCOM control for contract surveillance, operator training, software changes and maintenance troubleshooting."**

Similarly, when we first acquired aircraft arresting systems, the hardware led the manpower until the MAJCOMs recognized the urgency of having a central cadre of specialists to travel and help the bases. As an interim solution, we are offering MCP funds to the MAJCOMs for Title II consulting services by software house and electronic specialists to insure that the system and manufacturer's data provided by the contractor are both equal to the contract provisions and satisfactory for the base's needs. With the newer contracts calling for the vendor to provide complete documentation for both software and hardware, an engineer with graduate level education in digital electronics or data automation would be invaluable in representing the MAJCOM's interests. The newer Energy Monitoring Control Systems (EMCSs) permit software and cathode ray tube graphics changes from the keyboard. The steady hand of a specialist is going to be essential during the early stages to get full use of the equipment.

4. **"To conduct an effective air base energy conservation program, we believe that a reasonable number of building utility meters are required."**

Metered buildings provide bench marks of monthly consumption and related costs, which, at a minimum, encourage analysis of the need for such enterprises. It is recognized that certain process energy consumers such as flight simulators and communications systems have few apparent controllable parameters, but hard knowledge of large annual energy bills in the thousands of dollars stimulates innovative thinking. With minor exceptions, future buildings funded through the MCP will be built with installed metering for electricity, natural gas, oil, high temperature water and condensate. This will require that the occupant read his own meters and then report to the Conservation Committee minimal manpower or administration.

5. **"Our goal is to have at least one solar installation at every air**

(Continued on page 21)

Figure 1: EMCS Program

MCP	New Systems	Major Additions	Funds ($ Millions)
FY 76	3	10	12.4
FY 77	6	12	11.4
FY 77S	3	1	2.2
FY 78	11	3	10.2
FY 79	8	6	18.9
			$55.1 Million

Two years ago, the US Air Force Academy developed a Solar Test House to investigate the application of solar energy systems to a typical domestic dwelling. The progress of the solar facility and the lessons learned in the operation of the systems are proving to be most interesting. Here is an update on the

Solar Energy Program at the Academy

by Capt Anthony Eden, EIT, and Capt John T. Tinsley, EIT

Editor's Note: The following article discusses the progress of the Solar Test House at the US Air Force Academy and the lessons learned in the operation of its systems. In February 1976, this publication presented an article covering the construction of the solar energy system. The use of energy conservation techniques to decrease the thermal heating load, thermographic studies to efficiently balance the solar energy collectors and the actual performance for the first two years are discussed. Further details into these and the other areas investigated by the research team can be found in the Civil and Environmental Engineering Development Office Technical Report No. 77-34, "Second Interim Technical Report on USAFA Solar Test House." It should be noted that the urea foam used in the solar test house is being studied and is not a material that is approved for Air Force wide use.

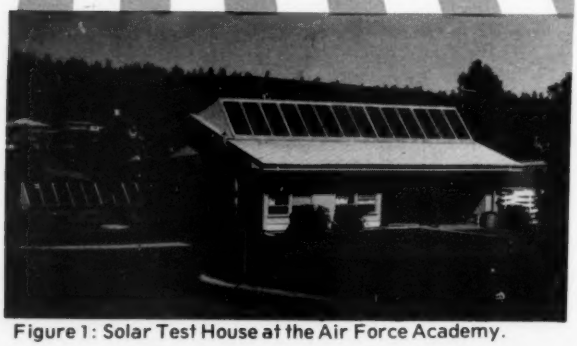


Figure 1: Solar Test House at the Air Force Academy.

The US Air Force Academy Solar Test House (STH) has been in operation since December 1975, **Figure 1.** The research laboratory was developed to investigate the applications of solar energy to supply the thermal loads for a domestic dwelling.

The Academy STH project involves the adaptation of solar energy systems to a typical domestic dwelling. At first, this retrofit application did not concern itself with respect to the energy consumption of this type quarters. However, during the second summer of operation, the structure's heat load was examined for possible retrofit improvements. These included the increase in insulation in the walls, ceiling and floor; the improvement of the insulation on the window panels; the use of vestibules for the two doors; and the installation of triple glazing on the windows.

Urea foam was injected into the cavities that exist in standard wood frame construction of the walls to increase the thermal resistance. The high R value of urea foam, which is 4.2 $\frac{ft^2\text{-}hr\text{-}^\circ F}{Btu}$ per inch, makes this

material very applicable to energy conservation. It does not settle when installed and its R value exceeds that of looser fill.

Table 1 shows the R values of the wall construction before and after use of urea foam. The resultant reduction of transmission of heat through the walls due to its use was anticipated at 47 percent or 1.45 MJ/hr (1378 BTU/hr).

The installation of the urea foam was accomplished by the contractor drilling holes into the exterior of the wooden walls of the house and inserting the foam with water under pressure. The brick veneer walls were filled from above by gaining access through the roof truss. Again, water was used to inject the foam. The entire operation was quality checked by thermographic studies and only one small area under a window had to be redone due to poor fill. The plugs that had been drilled out were replaced, sanded and repainted.

The urea foam did not have any noticable affect

R value from original wall:	
Surface	0.68
1/2" gyp board	0.45
1 1/2" insulation	5.00
2" air space	0.95
3/8" plywood	0.47
Waterproof paper	0.06
3/16" T.H.B.	0.45
Surface	0.17
	8.23 (U=0.122)
R value with addition of urea foam:	
2" air space	-0.95
2" urea foam	+8.40
	15.84 (U=0.064)

Table 1: Urea Foam Effects on R Value of Wall.
[R units = (ft² · hr · °F)/Btu]

on the wall integrity or paint after installation. Noticeable spots of peeling or buckling were not detected on either the exterior or the interior surfaces. Original concern as to the effect of the great amount of water necessary for insertion and its action on the wall material appeared to be unfounded.

Urea foam was also considered for use in the roof structure; however, the high cost of the foam and its weight when used horizontally led to the selection of loose fill for this area. Loose fill was blown into the roof joists to a depth of 152.4 mm (six inches) with a U value of 0.29 and with anticipated savings of 3.0 MJ/hr (2840 BTU/hr). The total cost of the insertion of the urea foam and the adding of loose fill to the roof was $1,125 for a house of 176.5 m² (1900 ft²).

The first thermography studies performed on the USAFA housing showed that the two movable panels under some of the windows were extremely inefficient at reducing heat transfer. These panels consisted of one sheet of quarter inch plywood with

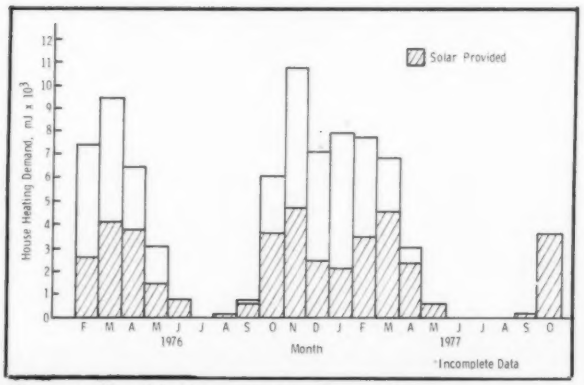
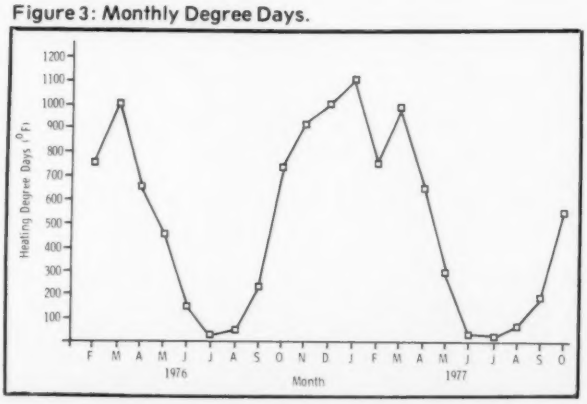


Figure 2: Monthly House Heating Demand.

a resulting U value of 0.86. These panels were replaced on all houses on base with modular sandwich panels made of one sheet of three-eights inch polystyrene placed between two quarter inch plywood panels. This construction lowered the U value to 0.30. This modification would result in an energy saving of 2.0 MJ/hr (1935 BTU/hr). The most neglected area for insulation in typical domestic dwellings is usually the floor. The crawl space beneath the houses was not insulated when originally constructed. To cut down on the energy losses through the floors, all the houses were retrofitted with 76.2 mm (3 inches) of fiberglass batts between the floor joists. These batts with an R value of 11 decrease the value of the floor from 0.310 to 0.0704. This reduction in U value would be applied throughout the structure in the rooms over the crawl space resulting in a new heat loss of 1.4 MJ/hr (1284 BTU/hr) through the 44.6m² (480 ft²) of floors.

The overall reduction of heat load in the house due to the use of the urea foam, roof insulation, crawl space insulation and sandwich panels was calculated as 28 percent. The comparison of **Figure 2** and **Figure 3** clearly shows the effects of the urea foam installation from January 1977 to the present (December 1977). The immediate and dramatic effect on the house heating demand was especially

Figure 3: Monthly Degree Days.



significant when the degree days of each month are compared from year to year. With both periods having nearly equal possible heat loads due to low ambient temperatures, and a reduction in actual heat load in the house, installation of urea foam proved its worth. This reduction allowed the solar energy system to operate to supply a smaller load, and directly improved overall efficiency.

Other techniques applied to reduce the heating load of the structure were vestibules and additional storm windows (triple glazing). Vestibules are air lock-type structures that can be built around a door to decrease the air flow through it during use. These small chambers allow entrance to the structure while not allowing direct exposure of the inside to the outside ambient air. The use of vestibules was considered on the STH to decrease the air infiltration load. This was especially important considering the many tours and visitors that frequent the structure. Two vestibules were built over the doors, **Figure 4.** The vestibule door was designed to swing out so that it was difficult to have both it and the main house door open simultaneously. This construction was accomplished during March 1977, and its exact effect has yet to be determined. The use of the eastern vestibule as a greenhouse has been considered by the occupants.

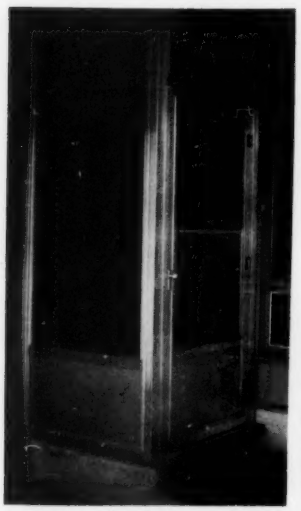


Figure 4: Vestibule on Main Entrance.

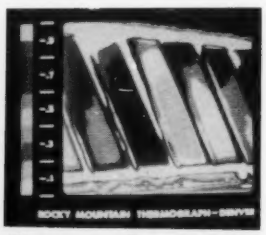


Figure 5: Thermograph of Ground Array.

Figure 6: Thermograph of Roof Array.

The windows originally installed in the STH consisted of one pane of glass and a storm window which is typical for the Colorado area. However, the infiltration of cold air through these windows was noticeable during high wind conditions. The interior surface of the windows was also known to have ice form on it during very cold weather. To slow down the infiltration of cold air, and to better insulate the house, triple glazing was installed in September 1977.

The method of applying the third glass layer was that of an interior storm window. This window fits into the existing frame and is tightly fitted with a rubber gasket. This construction greatly slows any air infiltrating around the glass. In using these windows on the southern two bedroom windows, another energy gaining technique is activated. Due to the "greenhouse" effect and better insulating value of triple glazing, a heat gain is realized from the solar rays striking those windows during the winter days. Thus, the passive aspects of solar energy can be used to decrease the heat load during the days when that load tends to be a maximum.

Thermographic Studies

The flow patterns throughout the solar arrays have always been of great interest to the research team. The equalization of flow through the various combinations of panels in clusters of threes and fours would allow the determination of the marginal effects of the last panel of each group. Originally, sensors were not installed on all of the panels to allow measurements of the temperatures, and only the addition of sensors and the multiplexer on the ground array finally allowed this measurement to be made. However, the use of a new technique for qualitative determination of flow distribution from temperature distribution was considered through thermography.

The thermographs are shown in **Figure 5** and **Figure 6.** The interpretation of these pictures is relative in nature. The number at the top designates the maximum range of the temperature scale at the left of each picture. For example, 50 represents 20 degrees C (68 degrees F) and shows that the range of 0.0 to 1.0 represents a relative difference in temperature of that amount. This allows comparison of the temperature differences of various points on the thermograph. If any temperature is known on one of the surfaces, then the others can be calculated from it. The pictures can be taken in color or black and white.

Figure 5 shows a close-up of the ground array through the thermographic equipment. This picture clearly indicates the various heat patterns present on the glass surface of the solar panels. Through the use of dry temperature sensors on the absorbing surface of each collector, this type of picture was qualitatively correlated to those measurements. The thermographs allowed the researchers to spot trouble areas and adjust the flow rate and pattern to equalize the heat gains of the various clusters.

A thermograph of the roof array is shown in **Figure 6.** The array had a series of air-blocked panels which appear as bright white in the figure. The darker panels to the right are flowing normally. Without the use of sensors, and just with the thermographic equipment, the roof array flow blockage was cleared and the system periodically checked for any reoccurrence.

Operations and Results

The first year of operation taught the researchers many valuable lessons. Air blockage in the parallel flow panels continued to be a problem. The slight leaks in the system allowed air to enter at night. It became trapped in the flow tubes and stopped the flow to that area of the absorbing surface. The nearby ethylene-glycohol mixture would then flash to vapor and a further blockage occurred. The installation of a bleed air system on each array solved that problem when operated in conjunction with a make-up water system.

The storage tank volume of 9,500 liters was discovered to be too large. A reduction to 6,800 liters and then 5,400 liters led to an increase in the usable energy level in the tank due to its elevated temperature. This, combined with lowering the minimum storage tank temperature at which solar energy is used, allowed for increased solar energy usage in the second winter (**Figure 2**).

The velocity of flow to the solar panels was reduced from 1.0 l/s (16 gpm) to 0.5 l/s (8 gpm) maximum to again raise the temperature of the storage tank to higher usable levels. Panel efficiency went down slightly, but the overall usage of solar energy for house heating increased.

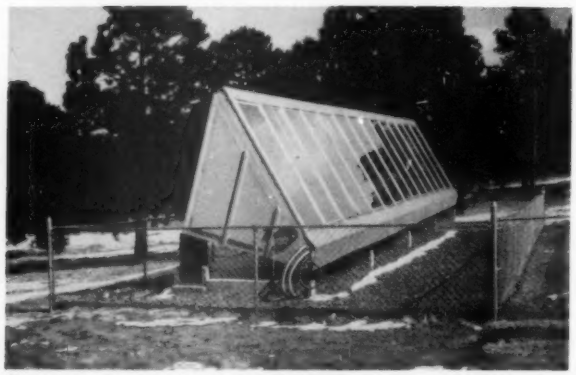


Figure 7: Ground Array at 60 degrees.

The variable tilt of the ground array was tested from September 1976 to March 1977. At the angle of 60 degrees, **Figure 7**, the ground array was slightly more efficient than the 52 degree roof array. The movement took approximately two hours and was accomplished each time by the Base Civil Engineering personnel. The variable tilt allowed greater solar energy collection during the most critical period of the heating season.

The energy conservation techniques finally showed their greatest effect starting in April 1977 until the present. The house heating load dropped tremendously and the solar energy system had an easier task to perform with less demand. **Figure 2** shows no load at all for the summer and greatly reduced ones in the fall. The solar energy system has supplied 100 percent of the needed heating load from 1 May 1977 until 6 November 1977 when the first heavy snowstorm and cloudy days finally forced the use of the natural gas furnace.

The solar test house energy consumption during the year from November 1976 to October 1977 was 47,504 MJ (45 x 10^6 BTU). The solar energy system supplied 50 percent of that, plus energy for the preheating of the domestic hot water. As the months progress into this winter, this performance should improve even more.

Conclusions

Solar energy can supply more than half the energy to heat a domestic dwelling. The systems involved require engineering design to eliminate predictable problems and to properly size the various components. Experience to date points to the validation of recommended flow rates, storage tank sizes and panel areas. Attention to details such as air bleed-off can make the system very easy to operate. The future plans for research at the STH include the design of a simple microprocessor-based controlling system to replace the existing research microcomputer. A third generation collector with evacuated glass tubes will be tested starting in the summer of 1978 to observe its performance in parallel with the flat plate collectors and to gain experience in the handling of higher temperature water. Design parameters will be finalized and reported for use in programming and engineering functions Air Force wide as solar energy systems become more common and applicable to solve energy supply problems.

E&S

CAPTAIN EDEN *is the Principal Investigator of the US Air Force Academy Solar Energy Program. An instructor at the Academy in the Department of Civil Engineering, Engineering Mechanics and Materials, he received his bachelor's degree in civil engineering from the Academy and his master's degree in civil engineering/facilities from the Air Force Institute of Technology. He is an Engineer-In-Training in Ohio.*

CAPTAIN TINSLEY *is an Associate Investigator of the US Air Force Academy Solar Energy Program and is primarily responsible for the control subsystem. An Assistant Professor at the Academy in the Department of Civil Engineering, Engineering Mechanics and Materials, he received his bachelor's degree in mechanical engineering from the University of Kansas and his master's degree in mechanical engineering at the University of Missouri.*

Directorate of Engineering and Services

Current Emphasis

brief commentary on significant developments

SARPMA UPDATE--In March 1977, the Implementation Planning Team began the development of the detailed, time phased planning document to implement the San Antonio Real Property Maintenance Agency (SARPMA) by 1 October 1978. The plan was submitted for Air and Army staff concurrence in September 1977 and approved in November 1977 for execution by HQ TAC. SARPMA will use approximately 2,000 personnel to provide the Real Property Maintenance Support to Brooks, Kelly, Lackland and Randolph AFBs and the Army's Ft Sam Houston. Utilizing industrial funds and authority to purchase locally, SARPMA represents a unique opportunity to implement simplified and flexible management systems and procedures.

AFR 85-X TEST--Testing of improved Base Civil Engineering management procedures has been completed. Change 3 to AFR 85-1 implementing 14 of 17 approved concepts worldwide were scheduled for release last month. The remaining three concepts cannot be implemented until the BCE reorganization is approved and AFR 85-10 and AFR 85-1 revised. A complete rewrite of AFR 85-1 to include all 17 concepts and the new BCE organization will be published in July 1978 to permit worldwide implementation by October 1978.

HIGH TEMPERATURE WATER HEATING SYSTEMS--A new manual for design of high temperature water (HTW) heating systems, AFR 88-28, has been published by the Department of the Army and the Air Force. This manual should be used for all future designs using HTW.

AFR 90-1 PUBLISHED--The new regulation for the management and utilization of Military Family Housing, AFR 90-1, has been printed and distributed.

MFH ENERGY AUDIT PROGRAM--A comprehensive energy conservation plan to significantly increase the funds available for energy conservation work in family housing is being prepared. The heart of the plan will be an ALMAJCOM energy audit of family housing units. The results of the audit will be used to support an Air Force request for supplemental FY 78 funds. Additional funds are required to accelerate the achievement of our energy conservation goals.

BASE FAMILY HOUSING OCCUPANCY RATE DECLINES--Failure to meet the 99% goal for the six month period ending 30 September 1977 cost the Air Force $1,542,000 in BAQ payments for personnel to reside off-base. The average vacancy due to maintenance (5.26) and assignment (5.03 days) provides a total of 10.29 days lost at change of occupancy. Maintenance downtime can be reduced through better scheduling of in-house forces or greater use of contractors to accomplish maintenance during peak turnover periods. Time lost due to assignment can be reduced by cancelling unneeded government leases, redistribution of on-base quarters between officers and enlisted personnel and by assigning ineligibles to adequate quarters. Both ATC and AFLC have, through innovative command management procedures, been successful maintaining an occupancy rate above the 99% goal. (Continued on next page)

TELETEACH SLIDE/TAPE AVAILABLE--Interagency/Intergovernmental Coordination for Environmental Planning (IICEP): A 32 minute video tape or slide/tape presentation explaining IICEP is now available through the Civil Engineering School Teleteach program. Please contact Capt Wayne H. Snowbarger or Capt Charles L. Pearce, AUTOVON 785-4552, to schedule this presentation.

AIRFIELD ICE CONTROL--Urea is not a panacea for airfield ice control. In most cases, when urea is used below 20°F it is not effective. An ice cover of one-quarter inch and a temperature of 11°F would require 57 pounds of urea for every 100 square feet to be de-iced; at 26°F the ratio would be 13 pounds per 100 square feet. Urea is best used when temperatures are fluctuating at and just below the freezing point.

BILLETING DUTIES for military billeting clerks and staff will be included in the 611X0 AFSCs in the 30 April 1978 change to AFR 39-1, Airman Classification Regulation. Specialty training Standard and Career Development Course revisions to incorporate these responsibilities will follow.

VEHICLE BUY PRIORITY LISTS--In March, bases will prepare vehicle buy priority lists for submission to MAJCOMs. If civil engineering equipment is a priority 3, 4 or 5, it will never receive funding for replacement. The Civil Engineering Vehicle Control Officer and Base Civil Engineer should insure they attend the Vehicle Authorization Board meetings which establish base priorities.

STORM WINDOWS IN FAMILY HOUSING--Storm windows removed for cleaning must be reinstalled properly if they are to retain their insulating value. The base news media should be used to inform personnel about the correct removal and installation procedures.

NEW FLOODLIGHT SET NEEDS GENERATOR--NSN 6230-01-033-1661, Floodlight Set, Tower, Telescoping, has replaced NSN 6230-00-181-2498 in TAx 008AA and 429 DH and L. A generator, NSN 6115-00-017-8240, must be mounted to complete the floodlight set. Item managers are expected to ship generators and floodlight sets simultaneously. Difficulty in obtaining generators should be reported to AFCEC/DOSE, AV 970-6213.

EXPANDED MFH IMPROVEMENT PROGRAM--OSD support for an expanded MFH improvement program for FY 1979 has been obtained. To date our total improvement program is approximately 30 percent complete. The FY 1977 and FY 1978 programs were relatively meager in that we were able to upgrade only 1,527 and 962 units, respectively. For FY 1979 we are planning to upgrade approximately 5,000 units. AFRCEs have been requested to start design of the CONUS projects, while design instructions for overseas projects have been recently issued to MAJCOMs.

SNOW REMOVAL TRAINING FILMS--Two films, "Cleared for Takeoff--Runway Snow Removal" TF 6052A, and "Cleared for Takeoff--Runway Ice Control" TF 6052B, are available for the orientation and training of snow removal personnel. Base film libraries can secure the films for requesting individuals.

APPLICATIONS ENGINEERING PROGRAM--AFR 93-8 established the Applications Engineering Program which establishes a means of field testing commercially available products, equipment and techniques not currently used by the Air Force. Centralized monitoring and periodic reporting of the performance of new items prevent duplication of effort and keep all personnel advised of the status of on-going evaluations. This program should be explained and emphasized at all levels to assure that everyone is aware of its purpose.

Outstanding Award, Base Library, Offutt AFB, Nebraska

The 1977 *Air Force* Design *Awards*

Special Award for Interior Design, Dental Clinic, Barksdale AFB, Louisiana

Honorable Mention, Combined Automotive Maintenance and Aerospace Ground Equipment Facility, Minneapolis IAP

Strategic Air Command and the Air National Guard were named winners in the Air Force 1977 Design Awards Program. The announcement was made at Homestead AFB, Florida, during the Directorate of Engineering and Services annual conference.

Maj Gen Robert C. Thompson presented certificates to representatives from Headquarters SAC, and the Air National Guard for their award winning projects which were submitted in the Second Annual Air Force Design Awards Program.

An Outstanding Award was presented to SAC for the base library at Offutt AFB, Nebraska. The facility was designed by the Architect-Engineer firm of Gollehon, Schemmer & Associates, Inc, Omaha. SAC also received a Special Award for Interior Design for the dental clinic at Barksdale AFB, Louisiana. The dental clinic was designed by the Architect-Engineer firm of Somdal Associates, Shreveport, Louisiana, in conjunction with the Air Force Health Facilities Office in Dallas, Texas.

The Air National Guard received honorable mention for the Combined Automotive Maintenance and Aerospace Ground Equipment Facility designed by the Architect-Engineer firm of Smiley Glotter Associates, Minneapolis, Minnesota.

The projects were selected by an Air Force jury consisting of three architects, a landscape architect and an engineer.

The Air Force Design Awards Program was established in 1976 to recognize architectural design excellence. All construction projects throughout the Air Force are eligible for consideration. The program provides a stimulus and incentive for all design professionals involved with Air Force construction to provide quality design with full regard for function, economy, energy conservation and accessibility for the physically handicapped. The Design Awards Program is an important part of the Air Force's involvement with the Federal Design Improvement Program. E&S

In these days of decreasing operations and maintenance money, a program which uses unimproved areas, establishes the Air Force as a leader in natural resource conservation, provides benefits to base people, and then pays for itself, is indeed

A "Diamond" in the Rough

by Capt David J. Wesley

When properly managed, forest plantings are compatible with the Air Force mission. At MacDill AFB, Florida, branches of pine trees in a plantation frame an F-4 as it taxies down the runway.

What do endangered species, timber harvests and nature trails have to do with service calls, minor construction and recurring maintenance? They are all a part of the responsibility of the Base Civil Engineer (BCE)! AFM 126-1, Conservation and Management of Natural Resources, assigns the BCE with responsibility for conducting a multiple-use natural resources program consistent with Public Laws and DOD and Air Force directives. Under this program, the Air Force is responsible for restoring, improving, developing, conserving and managing through wise use, the renewable natural resources under its control. As a trustee of over nine million acres of public lands, the Air Force mission is more than safeguarding the country; it also involves protecting our natural heritage.

The various renewable natural resources produced on lands under Air Force control are of national significance. Recognizing the importance of these

natural resources, the President and Congress through various public laws have directed that intensified conservation measures be implemented on all military lands. Therefore, the Air Force has issued several manuals and regulations on various aspects of natural resources management. The majority of these programs are outlined in **AFM 126-1, AFR 91-26, AFM 85-6** and **AFR 19-4.**

The natural resources management program is an integral part of the Environmental planning process; natural resource activities at Headquarters US Air Force and most of the major commands are under the jurisdiction of the Environmental Planning Division. At base level, natural resources management typically falls under the responsibility of the Engineering, Construction and Environmental Planning (EC&EP) Division. The size of the base and the quantity and quality of the natural resources will determine whether natural resources professionals are employed at base level. At bases which do not have a professional natural resources manager, an individual in the EC&EP Division with the appropriate educational background or interest is assigned the natural resources responsibility. This individual plays a key role in the environmental affairs of the base.

In the environmentally aware atmosphere of the 1970s, installation natural resources management is vitally important to all air base planning, development and construction. In addition to these planning and development activities, accurate inventories of and management plans for the natural resources of an installation are imperative for the preparation of environmental impact assessments and statements. Furthermore, natural resources provide abundant outdoor recreation, pleasing aesthetics and a quality living environment for Air Force families.

Contrary to popular belief, natural resources management is not something which applies only to installations with vast acreages of unimproved land. All Air Force installations must be involved in sound natural resources management. Currently, 85 installations have approved fish and wildlife management plans, 103 installations have approved outdoor recreation plans and 21 installations have approved forest management plans. During FY 1976, the Air Force sold over $1 million worth of timber and collected over $120,000 in hunting and fishing permits. These revenues are used to support the natural resources program.

The natural resources program includes forestry, fish and wildlife, endangered species, outdoor recreation, off-road vehicles, landscape development, erosion control, agricultural and grazing out leases, bird aircraft strike hazard and coastal zone management. This article deals only with the first five subjects.

Current Air Force policy requires that natural resources management activities must be planned and coordinated in a manner that will meet the needs of the American people without impairing the productivity of the land or impeding the mission. On areas that cannot be intensively managed for multiple-resource development due to mission requirements, the resources must be protected to the maximum extent possible.

AVON PARK
WILDLIFE MANAGEMENT AREA
A FEDERAL AID PROJECT
UNAUTHORIZED GUNS, DOGS, TRAPPING DEVICES NOT ALLOWED
FLA. GAME & FRESH WATER FISH COMMISSION & U.S. AIR FORCE CO-OPERATING
Cooperation between State and Federal agencies typify the Air Force Natural Resource program.

Fish from Federal hatcheries are available for stocking the ponds at the Air Force Academy in Colorado.

The illustrations that follow show how the Air Force is facilitating the military mission, reversing the downward trend in the quality of our environment and providing leadership in natural resources management.

Fish and Wildlife Management

The Air Force was the first military department to implement a model fish and wildlife program. Initiated by public law at Eglin AFB, Florida, in 1950, the program was such a success that a second public law expanding the basic provisions of the initial act to all military installations was passed in 1960. Air Force policy requires that all applicable installations develop and conduct active programs for the protection, conservation and management of fish and wildlife resources under the principles of multiple-use, sustained yield. The resources are managed for their recreational, scientific, cultural and aesthetic values while providing maximum use

and insuring against their destruction or depletion.

The fish and wildlife program involves the development of a management plan which includes an outline of management objectives, an ecological description of the installation, a list of plant and animal species present, a summary of the various types of wildlife habitats with their conditions and planned improvements, a listing of threatened and endangered species, and an environmental assessment.

Since many bases lack the professional expertise to develop a program, a cooperative agreement with the Regional Office of the US Fish and Wildlife Service (Department of the Interior) and the state wildlife agency can help provide the BCE with the necessary technical assistance to manage the program. Experience has shown that these agreements are beneficial and have been used extensively. All hunting and fishing permitted on a base is closely coordinated with the objectives and goals of the fish and wildlife management plan. Hunting and fishing seasons and bag limits must coincide with those of the state in which the installation is located.

While most people immediately think of hunting and fishing when they hear about the fish and wildlife program, there is an increasing emphasis on non-game and non-consumptive use of wildlife. This wildlife use is encouraged through the development of bird feeders, nest boxes, nature trails and many other actions which make wildlife visible to people. Special consideration is given to the protection of all threatened and endangered species identified by the Department of the Interior and the state in which the installation is located. These species are protected by law and the Air Force must insure that its activities are compatible with the existence of any species or their habitats which may occur on an installation.

Outdoor Recreation

Recreation resources as used in this context mean natural resources which provide or may provide opportunities for outdoor recreation. It does not mean or include facilities and programs normally associated with urban type development such as playgrounds, golf courses, swimming pools, gymnasiums and ballfields, which are covered in the **AFR 215** series and are operated by special services under the morale, welfare and recreation (MWR) program.

Outdoor recreation as described here is developed through the use of an outdoor recreation plan, which is written, managed and monitored by the BCE. Technical expertise from professionals in the Federal government and the state can be obtained through a cooperative agreement similar to the one for the management of fish and wildlife. The Outdoor Recreation Cooperative agreement is executed between the installation, the Regional Office of the Bureau of Outdoor Recreation (BOR) and the state recreation agency.

In December 1976, the Air Force received the Outdoor Recreation Achievement Award from the BOR for pioneering the cooperative agreement program for the Department of Defense. This new method of coordination between the BOR and the Air Force has resulted in improved recreational facilities and management for many bases.

Air Force land and water areas suitable for outdoor recreation are divided into three categories and are managed for specific recreation activities under the principle of multiple-use management:

Class I—General Outdoor Recreation Areas: Areas which can accommodate intensive recreation activities such as camping and water sports.

Class II—Natural Environment Areas: Areas which can support dispersed recreation activity such as hunting, fishing, hiking and bird watching.

Class III—Special Interest Areas: Areas featuring unique archeological, botanical, geological, historical or scenic importance such as historical buildings and Indian burial sites.

On installations where there is a demonstrated need and a suitable site, the BCE may designate areas and trails for off-road vehicle (ORV) use. These sites must be shown on a map and separate plans designating the areas and trails must be developed. The ORV plans include an environmental assessment (in addition to the one required for the outdoor recreation plan) which addresses the impact the ORVs have on noise, water, soil, vegetation, air, fish and wildlife, and other ecological parameters.

Forestry

Although forest land comprises only a small percentage of the total land area under Air Force trusteeship, trees play a major role in our natural resources program. The Air Force manages its timber resources through a comprehensive base forest management plan which provides for multiple-use, sustained yield management of the forest resource. It includes harvest cuttings, reforestation, timber stand improvement, forest protection and intermediate commercial thinnings.

Air Force forest management plans provide for mature and overmature timber to be sold on a competitive bid basis. There is no limit on the quantity of timber to be sold; however, the rate of cutting must be planned so that it does not exceed the requirements of the management plan or degrade the resource. All sale programs include provisions for regenerating the forest. Regeneration methods include leaving a random array of mature trees throughout a harvest area for natural seeding, mechanical seeding or the planting of seedlings. Reforestation is also conducted in areas where no harvest has been made. Many open fields on Air Force installations have been turned into productive and profitable forest management areas as a result of the reforestation program. This type of reforestation reduces maintenance costs (mowing) and provides the additional benefits a forest or timbered area afford.

Timber stand improvement is conducted on existing forest stands to improve the quality or quantity of the forest resource. This includes pruning, removing undesirable tree species, the use of chemicals, and precommercial thinnings which improve the growth and quality of the remaining trees.

Forest protection is another vital part of the Air Force forest management program. Through the use of close surveillance, chemicals, prescribed burning, fire breaks, and cutting, forest areas are protected from wild fires and disastrous disease and insect attacks. Properly protected and managed, Air Force forest resources provide additional benefits including erosion control, improved wildlife habitats, outdoor recreation, screening and sound abatement.

Funding

One of the most beneficial facts about natural resource programs is that some of them can pay their own way! Money received from the sale of timber and from the collection of user-fees for hunting and fishing is deposited in separate accounts and may be used for the salaries of natural resources personnel to implement the approved programs, to buy equipment and supplies and to perform contracts in support of management objectives of the respective resource management plans. More information about these programs can be obtained through the major command and from the Natural Resources Section, Environmental Planning Division, HQ USAF/PREV, Washington DC 20330.

An awards program has been established to stimulate command interest and recognize innovative leadership in the conservation and management of natural resources. Annually, the General Thomas D. White Environmental Awards are presented to recognize the efforts of installations in furthering environmental quality and the conservation of natural resources. Winners receive plaques and recognition from the Chief of Staff and are nominated for competition in the Secretary of Defense Natural Resources Conservation Award and the Secretary of Defense Natural Resources Personnel Award. Information about the awards program is contained in Change 2 to **AFR 900-45.**

CAPTAIN WESLEY *is a Staff Biologist, Natural Resources Section, Environmental Planning Division, Directorate of Engineering and Services, Headquarters US Air Force. He earned his bachelor's degree in biology from the University of Florida and his master's degree in wildlife management from Virginia Polytechnic Institute and State University.*

In these days of decreasing operations and maintenance money, a program which uses unimproved areas, establishes the Air Force as a leader in natural resource conservation, provides benefits to base people, and then pays for itself, is indeed a diamond in the rough! Through the development and implementation of these programs the Air Force is doing its part in insuring the protection and proper management of our natural heritage. E&S

Energy Productivity

(Continued from page 8)

programs. Work that can be accomplished by our shops will be expedited.

SUMMARY

The pilot Building Energy Audit Program developed a method for the Air Force to be responsive to the Presidential Executive Order. The motivation and zeal displayed by the team members were instrumental in making a success of the AFLC pilot Building Energy Audit Program. Air Force Engineering and Services has certainly blown its horn—BEAP, BEAP—toward a new direction in energy productivity/conservation for the US Air Force.

A copy of the complete Building Energy Audit Pilot Study performed by AFLC can be obtained through the Defense Logistics Information Exchange, US Army Logistics Management Center, Ft. Lee, Virginia 23801. Study No. LD 40340A. E&S

Contemporary

(Continued from page 10)

base. The objective is to enhance staff technical expertise, gain experience in the new technology and collect maintenance and energy savings statistics."

Current economic evidence still points toward our limiting Air Force investments in solar energy except for domestic water heating. However, as the market-tractors become more numerous, the economics should improve. Presently, Air Force investments are dominantly going to be funded from MCP authority vested in Section 607 of PL 95-82 which permits using residual funds to finance solar installations on current year MCP line items. At this time, 27 solar installations are in various stages of design and construction through this provision. Each project will include sufficient metering to permit calculating the actual conventional fuel savings and related cost avoidance. Nominations for adding solar domestic water, space heating and some air conditioning to existing FY 1977, 1978, 1979 and 1980 MCP line items are always welcome. However, use of Non-appropriated Funds to finance solar installations is discouraged due to the inherent unfairness of taking funds from the airmen to finance solar installations in this demonstration phase. E&S

PROMOTIONS

Sixty officers were named for promotion to lieutenant colonel by the Temporary CY 1977 Lieutenant Colonel Promotion Board. Selectees include:

PRIMARY ZONE

	Name	Location
	Aldinger, Richard T.	Sheyma AFB AK
	Allen, Theodore M.	HQ PACAF
	Barton, Roland S., Jr	Richards-Gebaur AFB
	Bierly, Richard M.	HQ AFMPC
	Bozarth, Thomas L.	HQ AF/PRE
	Bullard, Barry W.	HQ AFA/DE
	Carstensen, John R.	HQ AF/PRE
	Casey, Patrick J.	Incirlik CDI TK
	Caton, Philip E.	Duluth IAP MN
	Cavender, Dwight B.	AFIT/CES
	Clark, Walter L.	HQ/USAFSS
	Currin, David D.	HQ SAC
	Deinhammer, Richard	HQ USAFE
***	Demartino, Francis	Hill AFB UT
	Devaney, James E.	Bitburg AB GE
	Dierlam, Mark J., III	Keesler AFB MS
	Gilg, John F.	Webb AFB TX
*	Goode, Thomas R.	Randolph AFB TX
	High, John T.	Pease AFB NH
	Holcomb, Robert G.	HQ AF/PRE
	Howard, Russell, Jr	Shaw AFB SC
	Howo, William Y.	Williams AFB AZ
	Ibsch, William H.	AF South/Naples IT
	Jamar, Louis	Patrick AFB FL
	Judd, Thayne H.	Mt Home AFB ID
*	Kennington, Roy G.	HQ SAC
	Kishiyama, Arthur Y.	Hancock Fld NY
	Klumas, Lawrence J.	Keflavik Iceland
	Lambert, Robert W.	Patrick AFB FL
	Lazaroff, Eugene N.	Peterson AFB CO
***	Lee, David R.	Osan AB Korea
	Lopresti, Peter	Dallas AFRCE TX
*	Marsh, George E., Jr	Lajes Fld Azores
	Mayhew, Jason F.	HQ USAFE
	McCarthy, James E.	HQ AF/PRE
*	Meche, Norwood J.	MacDill AFB FL
	Newhall, Frederick	Anderson AFB Guam
	Nottingham, Wesley	HQ AF/PRE
	Piepenburg, Dwayne	HQ AFA
	Pullium, Jerry C.	Brooks AFB TX
	Pybus, Charles L.	Loring AFB ME
	Rever, Louis G.	Davis-Monthan AFB AZ
	Roberts, David E.	Taft Iran
	Robinson, Irl D., Jr	AFCEC Tyndall AFB FL
	Saulnier, Jean R.	Upper Heyford UK
	Smith, Fred D.	HQ TAC
	Smith, Reeves P., Jr	Wright-Patterson AFB OH
***	Walters, Roger W.	HQ AF/PRE
*	Wazney, Edward L.	Hurlburt FLD FL
*	Weimer, John R., Jr	Howard AFB CZ
	Wesselhoeft, Adolph	Wurtsmith AFB MI
	West, Hirum E.	Reese AFB TX
*	Whiting, Hubert L.	Keesler AFB MS
*	Wood, Wayne L.	Bolling AFB DC
	Wyatt, Ralph	HQ TAC

SECONDARY ZONE

	Name	Location
***	Bannwart, James L.	HQ TAC
*/***	Leach, Ronald S.	HQ AAC
***	Lupia, Eugene A.	HQ AF/PRE
***	Rodgers, Raymond E.	SAMSO/LAAFS
*/***	Rosa, James W.	AF/IG

Sixty-two officers were selected for promotion to captain by the Temporary CY 1977B Captain Promotion Board. They include:

	Name	Location
**	Adams, William D., Jr	Elmendorf AFB AK
	Ahsam, Edward J., Jr	Beale AFB CA
*	Allman, Clesson D.	Spangdahlem AB GE
	Alston, Lavon	Reese AFB TX
**	Alston, Warner L.	Sheppard AFB TX
**	Anderson, Gerald	Little Rock AFB AR
*	Andrepont, Patricia A.	Barksdale AFB LA
	Bennett, Joseph D.	Peterson AFB CO
	Bernard, Patrick W.	Keesler AFB MS
	Borcherding, Jerry	Tyndall AFB FL
	Boyce, Steven C.	AFIT
	Bradshaw, Joel C., II	Kirtland AFB NM
**	Brendel, Lance C.	Colorado Spgs CO
	Brosh, Andrew R., Jr	Osan AB Korea
	Bruce, Hugh A.	Osan AB Korea
*	Caldwell, Linda	Myrtle Beach AFB SC
	Clinchard, Charles	Mather AFB CA
	Cook, Michael J.	Osan AB Korea
	Cox, Billy J.	Keesler AFB MS
*	Carothers, Edna R.	Yokota AB Japan
	Dennis, Richard W.	AFIT
	Eastwold, Mark E.	Barksdale AFB LA
	Fehseke, Scott R.	Loring AFB ME
*	Ganer, Donald E.	HQ AAC
	Garris, Billy L.	Dover AFB DE
	Harper, Orester J.	Barksdale AFB LA
	Hayden, Thomas F.	Griffiss AFB NY
**	Hayes John R.	Tinker AFB OK
**	Hicks, Alfred B., Jr	Columbus AFB MS
**	Hrapla, Michael F.	AFIT
	Hughes, William F., Jr	Edwards AFB CA
	Hutchinson, Darrell	Wurtsmith AFB MI
	Judkins, James E.	AFIT
**	Kaiser, Richard L.	Hurlburt Fld FL
	Kay, William A.	Myrtle Beach AFB SC
	Keliipuleole, Sydney	Misawa AB Japan
	Kirkpatrick, Eugene	Lackland AFB TX
	Kotecki, Davis A.	Bolling AFB DC
	Laliberte, George A.	HQ MAC
	Lamar, David S.	San Vito IT
	Leopardi, Mark	Kunsan AB Korea
*	Liggins, Bennie R.	Blytheville AFB AR
**	Manchester, David F.	AFIT
	McCallister, Charles	Langley AFB VA
	Natal, Carlos A.	Howard AFB CZ
*	Peacock, Christie	Langley AFB VA
	Perry, Gilbert T., Jr	Norton AFB CA
	Ruschmann, David F.	AFIT
	Ryall, Paul J.	Edwards AFB CA
	Schmidt, Michael H.	Kirtland AFB NM
**	Selstrom, John P., Jr	McConnell AFB KS
	Spreckelmeye, Kent	George AFB CA
	Strudivant, Willis	Blytheville AFB AR
	Tanouye, Larry Y.	Griffiss AFB NY
	Thielan, Norman E., Jr	Eglin AFB FL
	Thuringer, Timothy	Arnold AS TENN
	Tom, Steven T.	Griffiss AFB NY
	Tyley, Jeffrey L.	Elmendorf AFB AK
	Viney, William R.	Arnold AS TENN
	Walton, Bruce A.	Malmstrom AFB MT
	Webster, David G.	HQ MAC
	Yeilding, James H.	Patrick AFB FL

* Services Officers
** Regular Appointment
*** Officers selected for Senior Service School

When the Air Force Engineering and Services Agency was formed, it heralded a change for the Air Force Services Office. With a new outlook and reorientation, AFSO now is directing its total efforts to food service, and laundry and dry cleaning.

The Changing Role of the Air Force Services Office

by Col Lewis G. Vale

The Air Force Services Office (AFSO) came into being in late 1947, after the Air Force became a separate operating service. Conceived along the lines of the Army Quartermaster Corps, the organization was to provide technical operating expertise to field units in the areas of commissary operations, mortuary activities and several other associated services functions. The role was not clearly defined and, as the office emerged, it leaned heavily on highly qualified military and civilian individuals, operating under what industry would call a "home office" approach. This philosophy has continued to the present time. AFSO was available on call to offer assistance and provide food service operating procedures by preparing manuals and regulations.

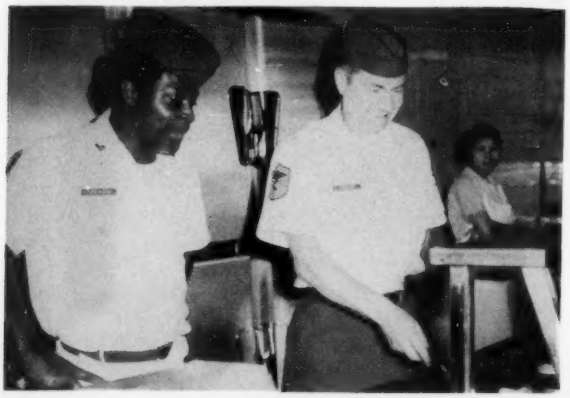
In the normal course of some 25 years, as Air Force strength and resources waxed and waned, many things changed, but the desire to provide a needed service prevailed. The formation of the Air Force Engineering and Services Agency (AFESA) and the incorporation of AFSO into AFESA was a pivotal point. It heralded a change that would mean a new outlook and a reorientation of food service. An AFSO that originally managed numerous technical areas would now be re-formed to direct its total efforts to food service, and laundry and dry cleaning operations.

Several studies which have been conducted in recent years have materially assisted in the redirection of the AFSO effort. The first of these studies was completed internally by AFSO and it dealt with the entire appropriated fund food service program. It identified various areas of food service that needed more attention, and at the same time, pointed the way to consolidate gains made in recent years. Essentially, it said the system was sound but that improvements in operating techniques were needed.

A somewhat more comprehensive study was then directed by Headquarters US Air Force, DCS/Systems and Logistics (AF/LG). Conclusions of this study reinforced those of the previous one, provided a sound basis for the feeding of airmen, and recommended several courses of action to improve their quality of life.

The most significant study in terms of food service, however, was a study of the entire food service functional areas by the Inspector General. This detailed report, while commending the Air Force for

Food Management Team Leader CMSgt Stewart, right, provides on site expertise on proper preparation and serving techniques during an assistance visit.



Upgrading older facilities by providing new equipment and redesigning interiors will make dining halls more attractive.

a considerable amount of progress and a high level of service, quite specifically identified certain functional areas which needed upgrading. Most important, however, was the recommendation to place AFSO more directly in the chain of authority and to increase its resources to provide greater management competence in the deficient areas. Running concurrently with these studies were internal AFSO programs that continually examined the state of the art and projected Air Force food service potential for the near future.

This is the background that led to the consolidation of AFSO into the AFESA family. While AFSO's middle name has always been **service**, it is now entering an era where the service motto will be expanded and directed toward utilizing the resources of AFESA, the expertise of the engineering side of the house and the customer oriented philosophy of the Air Force Commissary Service (AFCOMS).

This new and greater emphasis will be manifested by the ability to provide more help, in more areas, in a quicker time. The much closer organizational tie with the Air Staff will provide a two-way street:

- **Quicker reaction by easing communication, and**
- **Being delegated responsibilities previously handled by the Air Staff.**

Additional personnel resources will permit AFSO to provide assistance in critical areas of facility renovation and design. In certain areas which historically have been weak or poorly managed, AFSO will become more aggressive in its implementation of Air Staff policy decisions.

As previously mentioned, the IG identified several areas of food service operations that could be improved. A look at some of these areas—along with the approach to be taken—will give an insight into both the problems and the avenues of solution.

The effective management of contractor manned food operations has been a great concern. The rapid proliferation of contracts in the last few years multiplied the problem areas. Ineffective technical representatives of the contracting offices, poor contracts and inadequate contractor performance are just a few of the problems. There was a lack of Air Force wide guidance to all of the interested parties; there was no "resident food service authority." There were some outstanding people, but no central point of control.The acquisition of a specialist from industry who is well-versed from both the commercial and the military segment will offer AFSO a central point of control. This specialist, in conjunction with the newly established Air Force Contract Services Advisory Group (AFCSAG) will be able to provide the direction and control needed to assure that the Air Force gets its dollars worth from food service contracts.

Facility and equipment upgrading is another area of challenge. A surge of new construction in the late 1950s and 1960s provided the Air Force with many well-designed (at the time) and sound structures. Dramatic changes in the preparation and service of food have rendered many of these facilities almost obsolete. In order to establish an aggressive, well-coordinated program in keeping with current and anticipated advances in technology, a worldwide facility improvement program must be implemented. While this has been initiated in some major commands, a coordinated effort is required to assure that scarce construction money is spent where most needed. The expanded AFSO design and equipment staff working with Air Staff elements can assure the Air Force the finest possible facilities where most needed. A dining facility design concept, now almost off the drawing board, will give local planners and designers maximum flexibility while assuring manpower efficient preparation facilities.

The training of competent food service people who are ready and able to serve with equal competence in either a field kitchen or a dining hall is perhaps the most pressing need of AFSO. A multifaceted approach to mission readiness and consumer oriented food service is basic. AFSO, with expanded food management teams, will be able to schedule visits to bases on a regular basis in addition to responding to requests for assistance. The combined knowledge and experience of the food service management team members enable them to provide assistance and guidance in all aspects of food service. Additionally, use of the workshop concept creates an ideal environment for the teams to familiarize food service personnel with the latest techniques and practices.

A major concern still exists with the most basic commodity we deal with: food. In recent years, food has been increasingly more of a problem. Greater sophistication of the customer, numerous changes in the various support/supply elements, shortages and other things have contributed to a less than satisfactory menu available to the dining hall patron. A concerted effort involving the Defense Personnel Support Center (DPSC), its oversea depots, AFCOMS and food service must be mounted to get our planned menus to the table. For example, a recent experience with the inflight packet (IF) illustrates the need for each of the various elements—from manufacturer to the final customer—to get together and resolve difficulties.

(continued on page 28)

COLONEL VALE *is Chief, Air Force Services Office, Philadelphia, Pennsylvania. Previously, he was Services Commander/Chief of Services at Holloman AFB, New Mexico. He has a bachelor's degree from Western Kentucky University and is a graduate of the Industrial College of the Armed Forces as well as several other military schools.*

Chalk Talk

...a synopsis of academic activity to assist personnel

CIVILIAN UNIVERSITY OFFERINGS--Education in some of the areas of current concern to AFCEs can be obtained at Clemson University and the University of Wisconsin. Clemson is offering the 13th Annual Air and Water Pollution Control Seminar in March 1978 and "Life Cycle Cost Analysis for Engineering Projects" on 29 and 30 May 1978. For further information, write the School of Engineering at Clemson, South Carolina 29631. Wisconsin is offering "Designing Effective Work Environments" on 17 and 18 Apr 78 and "Solar Heating and Cooling of Buildings" on 8 and 9 Jun 78. Contact the Department of Engineering and Applied Science, Madison, Wisconsin 53706.

PROFESSIONAL MILITARY EDUCATION (PME)--All AFCE officers need to remember (and believe!) that PME is becoming more and more critical to be competitive for promotion. If you cannot attend in residence, get started on a correspondence course or a local seminar program. See AFR 53-8 and your local education office for additional details.

STATE-OF-THE-ART SEMINARS--The Civil Engineering School (CES) will be hosting a series of seminars and workshops which will focus on the latest technology. Seminars/workshops will be held in February, March, May and August on the subjects of environmental planning, architecture, energy, engineering and management. Each is designed to provide MAJCOM specialists with new concepts in areas identified by the MAJCOMs in response to a recent CES survey. Letters of invitation will be sent to MAJCOMs approximately 30 days before each seminar/workshop.

MAIL COURSE DEVELOPED ON SOLAR HEAT, COOLING--The Department of Energy (DOE) reports that an accredited correspondence course in the installation and maintenance of solar heating and cooling equipment has been established for technicians with skills in the air conditioning and plumbing crafts. Co-sponsors are the Sheet Metal and Air Conditioning Contractors National Association and the Northamerican Heating and Air Conditioning Wholesalers Association (NHAW). Enrollments will be through the Home Study Institute, a division of NHAW, at 1661 Henderson Road, Columbus, Ohio 43220. DOE said the curriculum for the course was developed by the Home Study Institute under contract to DOE. It is based on classroom curricula used by Colorado State University and will be available for use by other accredited correspondence schools. To insure a high rate of completion, DOE said, it plans to establish "an outreach homework assistance program" through the five national laboratories: Lawrence Livermore Laboratory, California; Oak Ridge National Laboratory, Tennessee; Brookhaven National Laboratory, New York; Sandia Laboratories, New Mexico; and Battelle Pacific Northwest Laboratory in Washington.

CIVIL ENGINEERING SCHOOL GRADUATES 25,000th STUDENT

When 2nd Lt Michael F. Reynolds graduated from the Base Civil Engineering Course at the Civil Engineering School of the Air Force Institute of Technology on 9 December 1977, it heralded another milestone in the history of the School. Upon acceptance of his diploma, Lieutenant Reynolds became the 25,000th student to complete a course of instruction at the School since it was founded in 1948.

Maj Gen Frank J. Simokaitis, Commandant of the Air Force Institute of Technology, presented a special plaque to Lieutenant Reynolds. The plaque was inscribed, marking the significance of the event. A second plaque to commemorate the milestone for the School was presented to the current Dean, Col Oren G. Strom, by the Directorate of Engineering and Services, Headquarters US Air Force.

Lieutenant Reynolds, a native of Watertown, Wisconsin, is serving in his first engineering assignment since graduation from the US Air Force Academy in June 1977. He is an assistant to the Chief of Operations and Maintenance, 46th Civil Engineering Squadron, Peterson AFB, Colorado.

The historical ceremony was also the occasion for yet another first in the history of the School. Maj Gen Robert C. Thompson, Director of Engineering and Services, Headquarters US Air Force, addressed graduation remarks to the class by means of Tele-Teach, a telephone link-up between Headquarters US Air Force and the School. Tele-Teach is a system employed by the School to provide short blocks of instruction to small groups of engineers at their bases through the use of a special speaker phone connection. The use of this system was employed as a contingency operation since inclement weather prevented the scheduled visit of General Thompson to Wright-Patterson AFB. It was the first time the system was used for this type of occasion.

Col O. G. Strom accepts a special plaque commemorating the occasion of the graduation of the 25,000th student from the Civil Engineering School from Maj Gen Simokaitis.

ANOTHER SCHOOL MILESTONE—2nd Lt M. F. Reynolds receives a plaque from Maj Gen F. J. Simokaitis as Col O. G. Strom looks on. Lieutenant Reynolds was the 25,000th student to graduate from the School since its founding in 1948.

Graduation of the 25,000th student is an especially historical milestone for the School. The origins of the School date back to the time of the establishment of the Air Force as a separate service in September 1947. The Air Force assumed the responsibility for the operation and maintenance of those air bases which had been turned over to it. The Army Corps of Engineers which had previously provided all engineering services was to withdraw its engineering personnel by June 1949. A new organization, called Air Installations, filled in for the Corps and was composed of many members who had transferred from it. A requirement for qualified engineers to grow as the new service would grow prompted Headquarters US Air Force to establish a special school to train and educate future Air Force engineers. Thus, the Air Installations Engineering Special Staff Officer School was born and in March 1948, 31 military officers enrolled in the Air Installations Engineering Special Staff Officer Course of the Air Force Institute of Technology. The officers represented the first class to enroll in and graduate from the School.

From that time until the present, several changes have occurred. Most notably, the name of the original School has been changed twice: in 1960 to the Civil Engineering Center, and in 1968 to the present Civil Engineering School. Though change was inevitable, it did not prevent the continuing flow of students through the years. Continued improvements in management systems, increased direct construction support and changes in ground support requirements of weapon systems made it necessary to increase the number and types of courses offered by the School. There are 22 engineering-related courses now taught or monitored by the Civil Engineering School. C&S

Consumer Advocacy & Services

Consumer advocacy is not a new role for Services. It has simply taken on an increased significance with changes in organization. It must continue to be a part of the charter of the Services function as long as Services is in the people business.

Maj Roy G. Kennington

Can you, as Chief of Services, Operations Officer, or Services Supervisor imagine yourself as a military Ralph Nader? Perhaps that's a bit far-fetched; however, in reality, it is closer to our relationship to the Army and Air Force Exchange Service (AAFES) and the Air Force Commissary Service (AFCOMS), than the term "liaison" which Webster defines as a "staff function which insures proper coordination between parts of an army."

Although everyone may not be familiar with the Webster definition, most have preconceived ideas and various personal definitions of what liaison really comprises. For example, Peter Drucker, in his books, **Management** and **The Practice of Management**, defines liaison, coordinator, expeditor and assistant as "frictional overhead" and indicates their use as a symptom of malorganization. He further classifies persons in these functions as individuals "whose job is to not have a job."

Considering the above, it is not surprising that we have difficulty articulating our functional responsibility to Commanders or personnel in lateral agencies such as Manpower or Personnel. Most who have had this rewarding experience will agree that it is infinitely simpler to "nail Jello to the wall" than to explain the Services liaison role with AAFES and AFCOMS. While our role is changed from **"providing the service"** to **"how this service is provided,"** the term liaison is certainly not adequately descriptive of the function. In reality, the term could apply to someone who simply passes notes or shuffles papers without any responsibility. Not only has the term had a derogatory impact on the image of the career field, but of greater importance, has in some instances, contributed directly in the reduction in grade authorizations.

This problem was addressed at the recent Services Training Review Conference at Lowry AFB, Colorado, and a decision was reached to use the term "consumer advocacy" to more vividly describe and define the Services role. While this concept is being interwoven into all resident courses at Lowry AFB, many Services personnel will not have the opportunity to receive that formal training; therefore, it is important that each of us has a common understanding of consumer advocacy and how it relates to what we do.

A description or explanation of "consumer advocacy" can be derived quite easily from close examination of the term. The word "consumer" needs no Webster treatment; we readily understand who the consumers are on any Air Force base. An "advocate" is described by Webster to be "one who pleads the cause of another." Can we then agree that the term effectively denotes the art of pleading the consumer's cause or interests?

Application of the art is, however, where it gets tougher. Sometimes our vision is blurred by a film of self-interest, and how can we plead a cause we cannot see clearly? The key, therefore, has to be for us to try diligently to remove the film of self-interest and view the situation as a customer does.

Another explanation of consumer advocacy can be found in the Defense Consumer Representation Plan:

"The Department of Defense has a long and successful tradition of providing protection for its members and policies, programs and plans that affect them as individuals, as members of the defense team, and as consumers in the marketplace. This tradition has been enhanced by the 'family' environment which characterizes military services in military communities. Inherent in the military are numerous procedures at installation level which permit DOD personnel to initiate their views regarding their interests as consumers of military or civilian products or services offered in the marketplace. It is here—in the military community—where the service member's (or his dependents) likes or dislikes are first made known, where corrective action may be taken or where referrals to higher Headquarters are accomplished."

To help achieve universal understanding and compliance, a simple definition of our role is not enough; our role must be specified in regulations, classification manuals, and the like. While the former was previously lacking, the latter is not and it provides sufficient guidance for us to follow. The Air Force directive on exchanges, **AFR 147-7**, charges both the major commands and bases with numerous responsibilities toward AAFES and AFCOMS. Those most important to us who are in the consumer advocate role are to:

- Evaluate responsiveness to customer needs and major command requirements (AAFES/AFCOMS);
- Coordinate hours of operation with responsible officials (AAFES/AFCOMS);
- Recommend policy or procedural changes to improve operations (AAFES/AFCOMS);
- Determine the requirements in coordination with the Commander of AAFES or his designee,

for authorizing the establishment, outlets, services and hours of operations, commensurate with optimum customer service, efficiency and economy of operations (AAFES);

- Request items of merchandise to be stocked, consistent with published stock assortment and other directives (AAFES); and
- Provide an appropriate element for liaison (AAFES/AFCOMS).

In view of the historical precedence established via our previous operational responsibility for both activities, most Commanders (both major command and installation) have designated Services as the liaison element. In doing so, they have delegated authority to us to insure that regulatory responsibilities are accomplished. Chiefs of Services at base level and Services divisions at major command levels have been charged with the institutional responsibility to carry out these functions which, by their very nature, are customer oriented and entail much more than simple coordination.

A regulation requires something to be done, but actually doing it is quite different, as most of us know. In this case, however, mechanisms or procedures are already provided to enable us to accomplish our objectives of becoming consumer oriented:

- Exchange Advisory councils;
- Regional Commanders' councils;
- Commanders' hot-lines;
- Commissary Advisory Committee;
- Suggestion boxes;

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- Personal contact with customers; and
- Frequent visits to all facilities.

It is obvious that the preceding actions are only conduits for observing and/or communicating problems.

The resolution of problems is a much different matter and is heavily dependent on an effective working relationship between the Services representative and the local AAFES and/or AFCOMS management. As we have all observed in the civilian sector, consumer advocacy has too often been an adversary relationship; each side fails to understand or care about the other's objectives, capabilities and limitations. We simply cannot afford to let this happen; our role with AAFES and AFCOMS is unique in view of: our historical relationship; Services has "stockholder" status (AAFES/Morale, Welfare and Recreation funds, AFCOMS/Surcharge funds); and the primary mission of both AAFES and AFCOMS is to benefit the military customer.

Neither AAFES nor AFCOMS can operate in a vacuum; each depends upon Services and the other base organizations to provide required logistical support. Services, in turn, must insure that its responsibilities to AAFES and AFCOMS, and their responsibilities to the military community, are fulfilled. Neither is mutually exclusive, but rather, in most cases, quite dependent upon the other. It is critical for Services to have a detailed knowledge and understanding of what AAFES and AFCOMS can and cannot do and how each operates. Although everyone in Services cannot attend the new courses at Lowry AFB, all have AAFES and AFCOMS regulations and manuals available. Self-study can produce the required results.

This article was written to explain the Services role in consumer advocacy and its relationship to AAFES and AFCOMS. This same general philosophy applies to other functions under Services with one significant variation: Services "owns" these activities and has the direct authority to initiate changes or correct deficiencies. This does not conflict with the consumer advocacy role; it merely simplifies the process and expedites actions.

Consumer advocacy is not a new role for Services. It has always been part of what we did if we were successful, whether or not we "owned" the operation. It has simply taken on an increased significance with changes in organization. Certainly, it is our role **now** and must continue to be part of our charter as long as we are in the people business. E&S

The Changing Role

(continued from page 24)

Actions resulting from the recent investigations into meat procurement have resulted in a rash of drastic, and sometimes contradictory, procedures being proposed for adoption by the Air Force. A test of procuring meat through the use of Institutional Meat Product System is now being conducted. If determined feasible, this procedure will drastically change many of our acquisition practices. By being physically co-located with DPSC, it allows AFSO to work these problems with them. A considerably more positive approach is being taken to assure that correct products are being procured and that delivery and supply/support, supply/systems and food service procedures are sufficient to guarantee the food is available when the menu calls for it to be served.

In summary, the changing role of AFSO is a reflection of the changing concept of the importance of people to our system. The Engineering and Services team is dedicated to use all of its resources to train its people to do their respective jobs and keep them as contented as possible along the way. AFSO has goals that are crucial to the attainment of those objectives and will achieve them with the augmented resources and "can do" philosophy. E&S

WORTH NOTING

P-15 Fire Truck Completes Verification Tests at AFCEC

The largest production wheeled vehicle in the Air Force inventory, the P-15 fire truck, completed verification tests at the Air Force Civil Engineering Center. If it meets specified requirements, the Air Force plans to buy 59 trucks at a cost of $25 million.

The P-15 fire truck, the largest production wheeled vehicle in the Air Force inventory, has completed three months of verification testing at the Air Force Civil Engineering Center (AFCEC), Tyndall AFB, Florida.

The lime-yellow truck has two and one-half times the capacity of fire trucks currently in the Air Force inventory. It had previously undergone climatic testing at Eglin AFB's special facilities.

Directorate of Fire Protection experts at the AFCEC put the P-15 through a 13 phase evaluation program. Included in the evaluation was a 100 mile hard terrain test, fighting simulated large aircraft fires, a 30 mile cross-country test, and combating large fuel fires.

The P-15 which is 45 feet long and 10 feet wide, weighs 68,700 pounds when empty and 133,000 pounds when loaded. It has two 430 horsepower diesel engines, one in the front and one in the rear, which provide a maximum speed of 50 miles per hour and the ability to climb a 50 percent grade. It can travel up to 10 miles per hour while negotiating 20 percent grades or side slopes while simultaneously pumping at full capacity of 2,400 gallons per minute of fire fighting agent from its turrets.

The P-15 will provide improved fire protection to aircraft parked close to one another. It can drive around a fire and let the fire fighters operate the turrets at full capacity at the same time. It has enough power so that if one engine fails it can continue to operate at reduced capacity on the remaining engine. It has been designed to operate in the non-paved areas adjacent to runways, taxiways and aircraft parking ramps.

The evaluation conducted by the AFCEC was part of a program in which three of the P-15s were put through extensive testing to determine if they meet specified technical and operational requirements. If the requirements are met, the Air Force plans to buy 59 trucks at a cost of $25 million.

28 Graduate with Honors from Lowry Technical Training Center

Twenty-eight Services officers and NCOs graduated with honors from the Lowry Technical Training Center, Lowry AFB, Colorado, during 1977. Honor graduates attained an overall average of 96 or better during the course of instruction in the following courses:

Supply Services Operations Officer Course: Maj William M. Chute, II, Blythesville AFB; Maj Joseph W. Fischer, Grand Forks AFB; Maj Galen W. McCreary, McGuire AFB; Maj George G. McCulley, II, Plattsburgh AFB; Maj Joseph F. Rivera, Kelly AFB; Capt Gary C. Bradham, Dyess AFB; Capt John M. Fortner, Goodfellow AFB; Capt John D. Hopkins, Hancock Field; Capt Frederick C. Wilcox, Bolling AFB; 1Lt Randy O. Barker, Keesler AFB; Bernard A. Sundrup, Wright-Patterson AFB.

Food Service Officer/Supervisor Course: Capt Gary C. Bradham, Dyess AFB; Capt Pamela A. Schonder, Pease AFB; 2Lt Beverly J. Carlson, Minot AFB; TSgt Lloyd E. Chace, Barksdale AFB; TSgt Jon P. Feagler, Grissom AFB; TSgt Hubert Parker, Carswell AFB; SSgt John C. Beckett, Griffis AFB; SSgt Kirk L. Chilson, Minot AFB; SSgt Victor B. Dennis, Jr, McGuire AFB; SSgt Stephen K. Henager, Eglin AFB; SSgt Michael A. Miller, Homestead AFB; SSgt Michael R. Rogers, Whiteman AFB; SSgt Gregory J. Sowash, Dover AFB; SSgt Robert W. Tompkins; F. E. Warren AFB.

Supply Services Supervisor Course: MSgt Joseph Leite, Jr, Kinchelow AFB; SSgt Benny C. Harper, Minot AFB; SSgt Robert A. Horney, Carswell AFB; SSgt Robert G. Rush, Nellis AFB.

By striving for higher standards for the wastewater treatment plant operator, the Air Force can and will lead the way for the DOD in abating water pollution.

by SMSgt Hermie Corns

A CASE FOR...

MANDATORY CERTIFICATION

The Air Force spent more than $120 million on water pollution projects between FY 1968 and FY 1975, and indications are that it may need to spend an additional $300 million in the next decade. Department of Defense (DOD) Directives 6051.1 and 5100.5 state that pollution from DOD facilities will be controlled. Priority for accomplishment will be second only to National Security, and the removal of hazards to health and safety of personnel. These are strong statements of intent.

Since the enactment of Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, the public has become more aware of water pollution and associated problems. This law mandates an extensive Federal and State campaign to prevent, reduce and eliminate water pollution. As members of the Air Force, we must play an active role to insure our facilities are not adding to the pollution problem. The wastewater treatment plant operator plays a critical role in this effort.

Today the wastewater plant operator must be more knowledgeable and competent in his daily operation to insure that each plant is doing its designated job. There are civilian and military plants nationwide which are not functioning as designed, mainly because of poorly trained operators.

The Environmental Protection Agency (EPA) and the Association of Boards of Certification for Operating Personnel in Water and Wastewater Utilities (ABC) are deeply involved in developing training and certification programs to insure our operators receive the necessary training.

This article will show how and why mandatory certification of wastewater plant operators will help the Air Force in its pollution abatement effort. Areas to be covered will discuss the reasons why mandatory certification is needed, the relationship between training and certification, a review of some State and Air Force programs for wastewater plant operators, and some problems that must be overcome to make certification a condition of employment for Air Force wastewater treatment plant operators.

Why do we need a mandatory certification program? The answer is hard for some to understand or accept. Water pollution has been with us for a long time. But, not until late in the 1960s, did the public become aware of the magnitude of the problem. Throughout the nation rivers and lakes were dying from pollution. They were deteriorating to a point where they could only support the lowest forms of aquatic life, and were limited for public use. Raw sewage, industrial waste and partly treated sewage were being dumped into the waters at such rates that it was impossible for them to recover. The solutions to the problem meant more money, more controls, better treatment plants and better trained operators. Technology to solve these challenges has advanced rapidly in the past two decades, but operator training programs have not kept pace. Certification of wastewater treatment plant operators was one means of identifying where we had operator problems. Where operators did poorly on certification tests and evaluations, plant operation and maintenance were also poor. This was a proven

fact based on many staff assistance visits to the field.

The relationship between training, certification and plant performance is important. A recent EPA study showed just how these relationships affected plant performance. The following findings were taken from that study:

"1. The influence of training on plant performance was found to cause some plants to change from a seriously non-compliant state to a fully compliant performance.

"2. In 19 plants where training was identified because of improved plant performance, it was estimated that almost $5,000,000 in capital dissipation was avoided by an investment of $62,715 in training. This is more than a 5000 percent return.

"3. The risk of capital dissipation is inordinately high. In a 50 plant sample, there was an estimated capital investment of over $8,000,000 under the responsibility of 126 operators, which calculated to be an average investment per operator of over $64,000. Some wastewater operators may be entrusted with as much as $200,000 worth of plant. This is very much higher than the $10,000 average invested by American industry for each of its production workers."

What makes these facts so important in the field of wastewater treatment is that it shows the real relationship between training and the operator's ability to do the job. Operator training, be it civilian or military, is one of the keys to a good return on our investment. The minimum qualifications necessary to be a good wastewater plant operator will continue to rise over the next five to 10 years, as well as the sheer numbers of well trained operators needed. The present supply of qualified operators cannot meet the projected demands. The next question is: What can we do to solve this problem?

If we can accept training as necessary to professional growth, and to upgrading of wastewater operator qualifications, we must then find a way to get the operators fully involved in the process. There is a critical interface between training and certification. We must look at this area closely to identify responsibilities and interdependencies. Some people think of operator training and operator certification as one and the same. Webster's dictionary defines **training** as "instruction so as to make one proficient or qualified;" it defines **certification** as "a written or printed statement testifying to a fact or qualification." The difference between the two is significant. You must first have a good training program as a foundation before a certification program can be effective. Certification then becomes the tool to evaluate the training program. Certification programs for wastewater treatment plant operators were primarily developed to protect the public health and the public's investment; but, it must also provide for entry into and advancement through the field for all qualified operators.

The EPA has a suggested outline of necessary capabilities for the wastewater treatment plant operators. They are not too different from those listed in the Civil Service Commission X-118C Handbook, **Internal Qualifications Guides for Trades and Labor Jobs** and the **Supplemental Qualifications Questionnaire, (WG-54—Fixed Industrial Equipment Operation Family).** The operating staff of a plant should be thoroughly knowledgeable and qualified in the following aspects related to the functioning of a wastewater treatment plant:

- Plant flow characteristics;
- Unit process operations;
- Sampling and testing techniques for process control and permit monitoring;
- Operations and maintenance procedures; and
- Job safety requirements.

These are only a few of the requirements for good plant operation. Plant operators at Air Force facilities are also responsible for training. A good training program must be provided to meet these basic skill requirements, and these same skills must be evaluated periodically to insure continued operator proficiency.

Now let us look at some of the State and Air Force programs dealing with wastewater plant operations. There are tremendous diversities between states when it comes to operator training and certification. The Air Force and DOD have no formal certification program. The Association of Boards of Certification studied the training and certification programs used by several states. Many fell far short of their objectives. Some of the certification tests were out of date, poorly written, or did not properly measure the needed skills for good wastewater plant operation. ABC recommends a comparative method to provide certification boards a tool for self-evaluation by using nationally recognized guidelines which are now being developed. The practice of certifying personnel in wastewater facilities has a history of more than 50 years in the United States dating back to the first program which started in New Jersey just after World War I. New York and Ohio followed with their mandatory certification programs in 1937. There are two basic types of programs used for certification today: mandatory and voluntary.

Mandatory programs are those backed by law in the form of a legislative act or state agency regulation. The remaining programs are voluntary in that there is no requirement for an individual to possess a certificate or for the utility to hire a certified operator.

Forty states now have mandatory certification. Hopefully, all states will have mandatory certification by 1983.

There are many wastewater treatment plants that do not come under state jurisdiction; for example, any federally operated wastewater treatment plant. Here lies some of the problem for the Air Force. Executive Order 11507 (February 1970) established

SERGEANT CORNS was the Command Sanitation Superintendent, Mechanical Utilities Division, DCS/Engineering and Services, Headquarters Strategic Air Command, Offutt AFB, Nebraska, when he authored this article. Since then, he has been assigned to the 601st Civil Engineering Squadron, Sembach AB, Germany. He received his bachelor's degree in business management from the University of Nebraska.

that the Federal Government shall provide the national leadership in the effort to protect and enhance the quality of our water resources. DOD goes a little farther and states in its directives, DOD 6051.0 and 5100.5, that all DOD components will demonstrate leadership in pollution abatement and will cooperate in development of abatement programs with local communities. Federal orders and directives encourage and support federal leadership and cooperation but federal facilities are not under state control; therefore, mandatory state certification programs are not applicable to employees of the Federal Government. Hence, Air Force and DOD wastewater treatment plant operators do not have to be certified as a condition of employment.

This is one point California and other states are now challenging in the courts. Air Force policy on operator training and certification is provided in **AFR 91-9**, Water Pollution Control Facilities, which states that certification is highly recommended, though not mandatory. The policy recommends sufficient training be provided to enable operators to be competent to a level equal to that of necessary certification in that state. The Strategic Air Command (SAC) has gone a step further and has established a voluntary certification program for its wastewater treatment plant operators. This program was started in October 1972; to date, over 300 water and wastewater operators at 27 SAC bases across the country have been certified. This is a step in the right direction, but still far from being enough.

There are many problems that have to be overcome before mandatory certification can become a condition of employment for Air Force operators. If certification is to become mandatory, there will have to be changes to the Civil Service Regulations. The X-118C handbook sets the basic standards for job qualifications for operators. Air Force Form 2348, Supplemental Qualifications Questionnaire, is also used for selection and placement of operators. The Civil Service Commission is currently authorized to establish standards with respect to citizenship, age, education, training and experience. Certification could be made a key part of the training and experience factor. If it is not possible to change the basic Civil Service rules, efforts must then be made to change the Air Force supplement to the Civil Service Commission Manual. The supplement could require special quality points be awarded for all those applicants having state certification. Certification as a wastewater treatment plant operator should also be a special merit factor under the Federal Merit Promotion Program for those currently working for the Air Force. It is imperative that managers at all levels realize the importance of a well trained and certified wastewater treatment plant operator if plants are to comply with the more stringent standards of the 1980s. The Air Force is increasing its capital investment in plants with sophisticated treatment systems; these new systems will require more and better trained plant operators to protect that investment. Mandatory certification has to become a reality for all Air Force wastewater treatment plant operators if they are to be truly effective.

The Air Force must continue its efforts to improve and develop training and certification programs. Making certification mandatory for all wastewater treatment operators is a step in the right direction, but we still have a long way to go. By striving for higher standards for the operator, the Air Force can and will lead the way for the DOD in abating water pollution. E&S

2750th CES Presented Outstanding Unit Award

The 2750th Civil Engineering Squadron, Wright-Patterson AFB, Ohio, was presented with the Air Force Outstanding Unit Award recently.

Air Force Logistics Commander, General F. Michael Rogers, read the citation which said in part, . . . "the squadron rendered outstanding service and support to the host command and to numerous tenant units at Wright-Patterson. . .

". . . the Squadron was instrumental in preventing possible loss of life and thousands of dollars in farm and dairy products. . ." during last winter's bitter cold in the area.

The Squadron, headed by Col William G. Robb, employs 13 officers, 163 airmen and 853 civilians.

Col W. G. Robb, Commander of the 2750th Civil Engineering Squadron at Wright-Patterson AFB, Ohio, accepts the Air Force Outstanding Unit Award from Gen F. M. Rogers, Commander of Air Force Logistics Command.

ALMOST 82% RESPOND

READERS REVEAL LIKES AND DISLIKES

All of us need a periodic assessment of how we're doing in our jobs and a system to do this is provided via the various performance rating methods for officers, airmen and civilians. We in the public information business also need to know how we're doing in keeping our readers informed.

The **Air Force Engineering & Services Quarterly** recently got such an assessment in the form of a readership survey. Out of a total 2,825 of you—officers, airmen, civilians—who were given the opportunity to grade this publication, exactly 2,315 responded. Translated into percentages, 81.9% of you signed off on the **Quarterly's** report card.

As flattered as the editorial staff was to learn that such a tremendous return had been garnered by the publication (in most surveys, a response of between 10 and 15% is considered good), we learned a lot about what you like and dislike about your magazine.

In the paragraphs which follow are some results the magazine staff had determined:

• **Personal Data:** In this area, 91% of you are key personnel (officers, GS civilians, Airmen E-6 through E-9) in the engineering and services career fields, with over 61% in the important "bread and butter' disciplines of operations and maintenance and management/administration. You also indicated that almost 60% of you have more than 11 years of continuous service in the career fields.

• **Readership Awareness:** Over 55% of you reported that you read all or more than half of each issue published. In line with this percentage, over 52% of you reported that you either read or scanned three specific articles published during 1976-1977. A most satisfying statistic revealed that 63% of you definitely like the three continuing departments (Current Emphasis, Director's Message, Counterpoint: Point) published in each issue.

• **Personal Taste and Opinion:** Over 93% of you indicated that you find the information published in each issue useful in varying degrees and over 81% said you consider the publication interesting and informative. Here's how you rated the following categories:

Contents: 82% responded good to excellent;

Graphics: 85% said good to excellent;

Photos: 81% said good to excellent; and

Printing/Paper: 89% reported good to excellent.

Finally, when we asked how you would rate the **Quarterly** overall, your response revealed a solid 85% of good to excellent.

• **Distribution Effectiveness:** This is the most dissatisfying aspect of any operation in the magazine function. Close to 19% of you strongly voiced the opinion that distribution is not adequate. Previous surveys have indicated a problem in this area and apparently the problem still exists.

This is, however, a problem that you can solve for yourselves if you are one of those who does not see the magazine on a regular basis. Go to the Publications Distribution Office on your installation, request an AF Form 764A, fill it out and return it to the PDO who then will process your request.

Only 4,500 copies of the magazine are actually available for distribution to our engineering and services workforce of over 70,000 people. While not enough copies are available to provide one for each reader, distribution can be increased if enough of you make your requirements known to your respective PDOs. See your PDO and request the exact number of copies your organization needs.

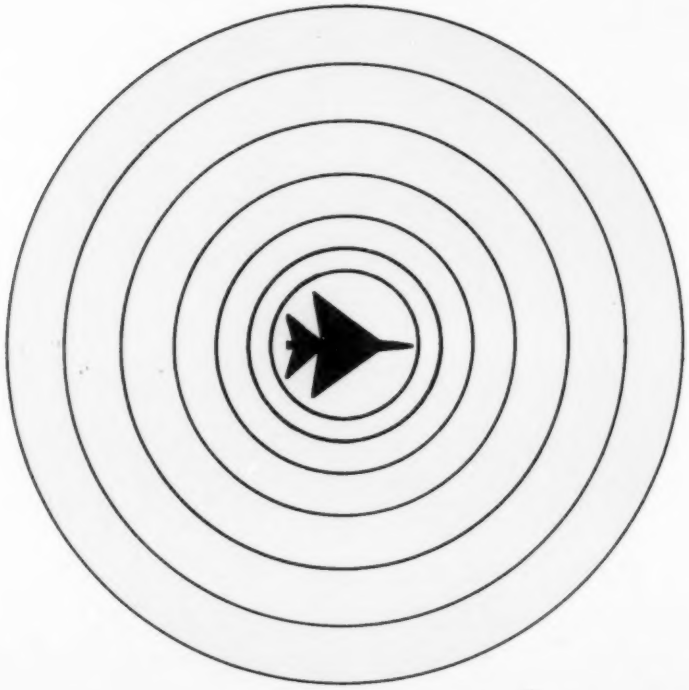
In conclusion, over 800 of you took the time to write down every conceivable suggestion on how the magazine can be improved. We're in the process of sorting these comments out and you can be sure that many of the suggestions will be turned into realities in the issues of the magazines to come.

The editorial staff takes this opportunity to express its appreciation to all of you who responded to the survey. E&S

The AICUZ Air Installation Compatible Use Zone Program at Dobbins AFB

The Air Installation Compatible Use Zone program has been designed to achieve compatibility between installations and neighboring communities by means of a compatible land use planning and control process carried out through appropriate legislation at the state and local level. Here is an excellent example of how Dobbins AFB is carrying out its program.

by Col John H. Smith



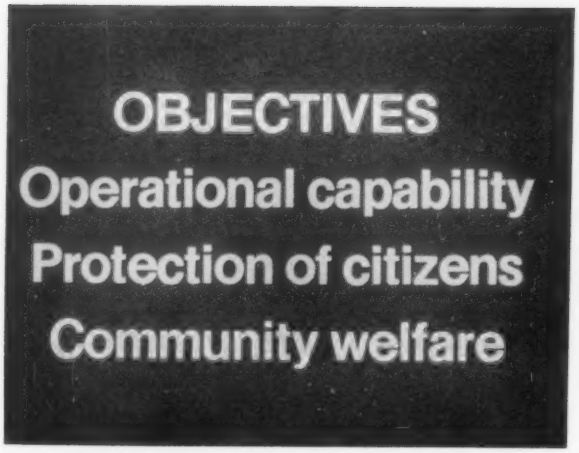
Editor's Note: The following remarks were delivered by the Base Commander of Dobbins AFB, Georgia, to local level officials and citizens of Cobb County, where the base is located, on the importance of compatible land uses. It is an example of the efficient manner in which the base is handling the Air Force AICUZ program.

Environmental management is one of our most serious national concerns. The Air Force is actively involved. Problems of airfield encroachment, noise pollution, socio-economic relationships and environmental impact have required the Air Force to intensify its involvement and participation in comprehensive community and land use planning at the local level, and in intergovernmental coordination at the Regional, State and Federal levels.

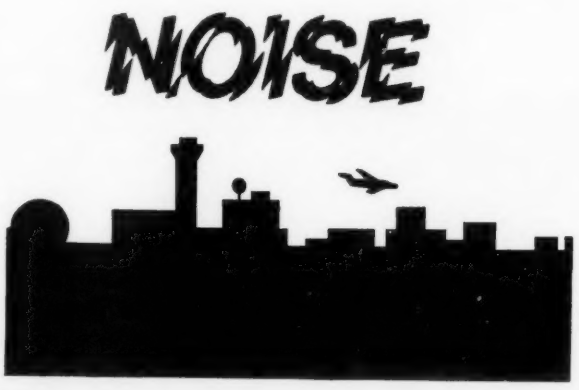
We have found that, unless we engage in coordinated planning which bridges the gap between the Federal government and the local citizen, we may be forced to curtail, delay or even stop our aviation activities because of litigation or controversy. The issue is coexistence between an air installation and the adjacent community.

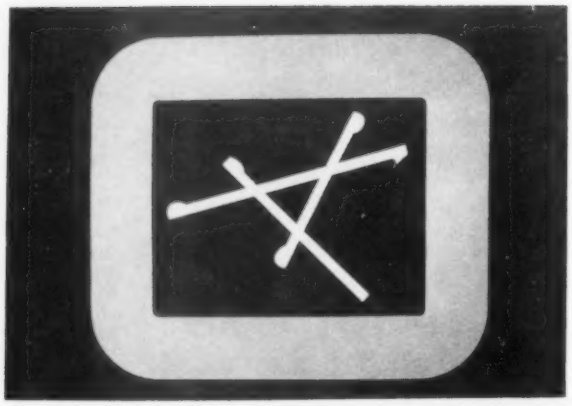
As part of our overall Air Force environmental and community planning effort, the Air Force developed—and the Department of Defense established—AICUZ, which is an acronym for Air Installation Compatible Use Zone. AICUZ is simply a concept of achieving compatible land use in non-government areas adjacent to military airfields. For example, a low profile warehouse or storage structure near an airfield would pose no problems to military flight operations and, therefore, would constitute compatible land use. However, it doesn't take too much imagination to realize the problems that a high-rise structure would create in exactly the same location. Besides the height of structures, their use concerns us. To build a hospital or school in a high-noise and accident potential area, would not constitute compatible land use. In other words, AICUZ is a means by which we can maintain operational capability and prevent airfield encroachment, while accommodating compatible civil growth and development. It works through the public land use planning and control process.

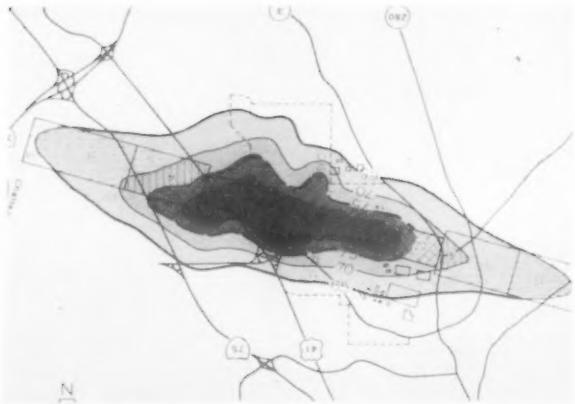
Although this sounds relatively simple, AICUZ is a highly complex and demanding program, designed to provide a comprehensive, rational basis for cooperative planning and action. The Air Force has been a leader in the subject of airfield environs land use planning since the 1950s when it first started evaluating the impact of noise around airfields, but much of the work, until recently, was of a laboratory nature. We, as well as other airport operators, know that we have a problem, and that problem is encroachment of our installations, caused by incompatible urban development. Historically, this encroachment has resulted in the reduction of mission capability, and has contributed to base closures or the elimination of flying.



We have found that no other agency has the direct responsibility of protecting Air Force bases, or for that matter, the people near our bases. Other Federal agencies, such as the Environmental Protection Agency, Federal Aviation Administration, the Department of Housing and Urban Development, and Veterans Administration, are involved to one degree or another, but only the Air Force has the prime responsibility. This is also true for civilian airfields in that the responsibility rests with the airfield operator. By approaching this matter on the basis of mutual concerns, which AICUZ does, the Air Force has a tool and the flexibility to avoid problems resulting from incompatible development. Our AICUZ objectives are quite simple. The primary objective is to maintain Air Force operational capability. A second, and equally important reason, is to assist local authorities in the protection of their citizens. Since the Air Force mission is to protect the American people, it follows that we must exhibit this same concern for their protection in our daily operations. The protection and promotion of the public health, safety and welfare are addressed by AICUZ. In terms of health, we are talking about noise exposure. For safety considerations, the Air Force must be aware of aircraft accident potential to adjacent land areas as well as







hazards to our operations from improper land uses. The third factor is that of the community welfare, both economic and social. Air Force bases are major industries and social centers, and as a result, are a key element of the community fabric. It is therefore necessary, in the interests of the community, to retain them.

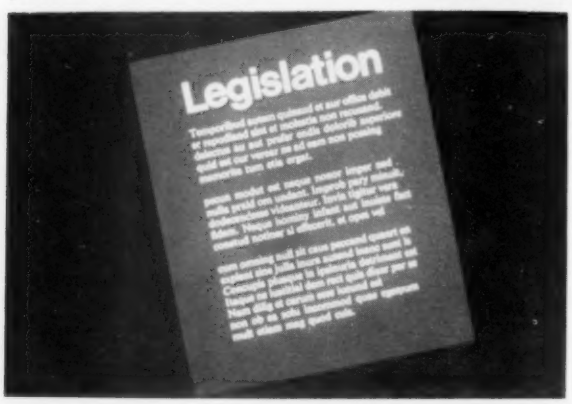
The Air Force AICUZ program has been designed to achieve compatibility between installations and neighboring communities by means of a compatible land use planning and control process carried out through appropriate state and local legislation and intergovernmental coordination with Federal agencies. This is the first time in military—or to the best of our knowledge, civil—history that a process has been developed that approaches the successful accommodation of such interests. Today's AICUZ concept developed through an evolutionary process. It started in 1971 with the Air Force "Greenbelt" program which arbitrarily designated an area around airfields for which we identified special land use considerations. In 1972, the Air Force renamed the program AICUZ and began working cooperatively with local governments. By mid-1972, the Air Force found that a simplified, arbitrary approach would not work, and as a result, a methodology was developed in which noise zones and accident potential zones were designated and combined, by overlay, to create a single map of compatible use districts. Land use compatibility guidelines have been developed for each of the compatible use districts. This map, the land use compatibility guidelines, and a full analysis of the relationship between aircraft operations and adjacent land use, are published as an AICUZ study document.

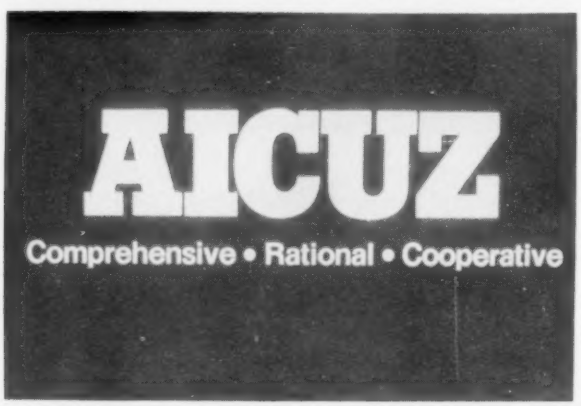
AICUZ studies began at 92 Air Force bases. including Dobbins AFB, Georgia, in October 1973. It was a massive effort involving 10 functional areas. Data was collected on operations, weather, economics, state and local laws, operational hazards, accidents, land ownership, community development, and the relationship between the base and the community.

Our development of the Air Force AICUZ program began with a complete layout of flight paths and altitudes of aircraft operating out of Dobbins AFB, to get a visual display of the overall noise picture from an aerial point of view. These flight paths, combined with other operational and noise source data, created a composite set of noise zones surrounding the base.

A set of accident potential zones was created, outlining the most hazardous areas, by relating an Air Force study of the history of aircraft accidents worldwide to our facilities at Dobbins AFB.

The noise zones and accident potential zones were combined to create a single map of compatible use districts. This map, used with related land use compatibility guidelines, provides basic data for plan-





ning compatible development around the Dobbins AFB complex.

Nationwide, the Air Force AICUZ program is producing tangible results. Land use control ordinances based on AICUZ have already been enacted or amended around many bases. Historically, the citizens of Cobb County and the personnel of Dobbins AFB have worked together in cooperative and harmonious efforts to better serve the needs and desires of all concerned. We have collectively found solutions which have maximized the benefits of Dobbins AFB while minimizing the annoyances. The Dobbins AFB complex, including the Lockheed-Georgia Company, provides full time employment to more than 15,000 people and contributes more than $200 million annually to Cobb County and its cities, through payrolls, purchases, taxes and school subsidies. If the future of Dobbins AFB is to be as bright as its past, you, the citizens of Cobb County, will once again need to participate in the solution of our mutual concerns. We request your careful and considered review of the recommendations contained in the Dobbins AFB AICUZ study. In brief, these recommendations include:

- The AICUZ study should be adopted as an official premise for future planning.
- Zoning ordinances should be adopted, or modified, to reflect the compatible land uses outlined in the AICUZ study.
- Fair disclosure ordinances should be enacted to specify disclosure to the public of those AICUZ items directly related to the Dobbins AFB complex operations.
- Height control of structures near flight paths should be regulated by incorporation into zoning ordinances.
- Comprehensive plans need to be developed, or updated, to include the land use recommendations of the AICUZ study.
- Subdivision regulations should provide for compatible land use review, imposition of conditions to minimize or prevent incompatibilities, open space dedication and berm or barrier construction.
- Building codes should be amended to require structural noise attenuation for buildings to be located in the noise zones, thus expanding the range of compatible land uses.
- Capital improvement programs should be carefully reviewed to discourage incompatible land use patterns, with particular emphasis on utility extension planning.

COLONEL SMITH *has been the Base Commander at Dobbins AFB, Georgia since July 1976. He also commands the 94th Command Support Group. He is a graduate of McNeese State College, Lake Charles, Louisiana, with a bachelor's degree in accounting. Colonel Smith has held several positions in the field of logistics at NAF (Reserve), Wing and Group levels.*

At the beginning of my remarks, I stated that the issue is coexistence between air installations and adjacent communities. The AICUZ program is an example of how the Air Force is addressing this issue. This program is not intended to be a one-time effort. As situations and conditions change, AICUZ data will be revised.

I hope that my comments have been successful in conveying to you the level of the Air Force commitment to environmental quality and community planning. We are convinced that aviation facilities can be good neighbors, but only if those of us involved in aviation make the effort to cooperate with local officials and citizens to resolve mutual concerns and problems. We, the taxpayers, cannot afford the luxury of building new bases to replace those forced to close by incompatible development. Dobbins AFB is a vital asset to this community, and we want to stay. With your cooperation and support, we will.

E&S

AAC, ATC, PACAF, SAC Win Bordner Awards,

The William H. Bordner Awards for the outstanding prime electrical generating plants and heating plants in the Air Force were presented to four major commands at the 1977 Engineering and Services Conference at Homestead AFB, Florida, in November. Additionally, four citations were presented to outstanding Services personnel.

Bordner Award winners were:

- **King Salmon Airport, Alaska (Alaskan Air Command):** Category I: Prime electrical generating plant with an installed capacity from 100 to 2,000 KW.
- **Clark Air Base, Philippines (Pacific Air Forces):** Category II: Prime electrical generating plant with installed capacity over 2,000 KW.
- **Central Heating Plant, Bldg 860, Randolph AFB, Texas (Air Training Command):** Category I: Heating plant with an installed capacity of 3.5 to 14 million BTU/hr.
- **Central Heating Plant, Bldg 7310, Loring AFB, Maine (Strategic Air Command):** Category II: Heating plant with an installed capacity over 14 million BTU/hr.

Maj Gen R. C. Thompson
Col David L. Waldron (AAC)

Maj Gen R. C. Thompson
Col Elo Mussetto (ATC)

Maj Gen R. C. Thompson
Col Richard H. Hinz (PACAF)

Maj Gen R. C. Thompson
Brig Gen C. D. Wright (SAC)

Maj Gen R. C. Thompson
Maj Thomas H. Haines, Jr

Maj Gen R. C. Thompson
CMSgt Raymond A. Puckett

Maj Gen R. C. Thompson
TSgt James L. Beazel

Maj Gen R. C. Thompson
Maj Richard A. Probst

Four Services Officers Honored

Services managers who were outstanding in their respective areas were:

- **Maj Thomas H. Haines, Jr, Chief, Services Division, 10th Combat Support Group, RAF Alconbury, England:** Outstanding Senior Services Manager Award. He was cited for his positive approach to the management and operation of his Services activities which have benefitted those whom he supported as well as for his efforts on behalf of commissary, exchange, food service and billeting improvement plans.
- **Capt Richard A. Probst, Chief, Services Division, Offutt AFB, Nebraska:** Outstanding Junior Services Manager Award. He was recognized for his contributions to food service improvements in his capacity as chief architect of SAC's a la carte food service program and for dining facility and mess attendant contract improvements.
- **CMSgt Raymond A. Puckett, Food Service Superintendent, 355th Services Squadron, Davis-Monthan AFB, Arizona:** Outstanding Services Superintendent Award. He was cited for his knowledge of the Air Force food service operation and programs which aided in the development of programs and procedures that resulted in the enhancement of the food service branch.
- **TSgt James L. Beazel, Food Service Supervisor, 6950th Air Base Squadron, RAF Chicksands, England:** Outstanding Services Technician Award. He was recognized for his professional skills, leadership and efforts which resulted in the development of a unique dining facility making it one of the best in the Air Force.

☆ U.S. Government Printing Office: 1978—757-095/4